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SOCIETY OF SCOTLAND

WITH

AN ABSTRACT OF THE PROCEEDINGS AT BOARD AND GENERAL
MEETINGS, AND THE PREMIUMS OFFERED BY
THE SOCIETY IN 1943

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FIFTH SERIES

VOL. LV.

EDITED BY JOHN STIRTON, SECRETARY TO THE SOCIETY

EDINBURGH:
WILLIAM BLACKWOOD & SONS LTD., 45 GEORGE STREET
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* * *It is to be distinctly understood that the Society is not responsible for the views, statements, or opinions of any of the Writers whose Papers are published in the 'Transactions.'*

JOHN STIRTON,
Secretary.

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TRANSACTIONS
OF
THE HIGHLAND AND AGRICULTURAL
SOCIETY OF SCOTLAND

SOME PRACTICAL APPLICATIONS OF SOIL
RESEARCH.

By A. B. STEWART, M.A., B.Sc., Ph.D., Macaulay Institute for Soil Research,
Craigiebuckler, Aberdeen.

SOIL TESTING AND ADVISORY WORK.

FROM careful inspection of a soil it is generally possible to form a fairly good idea of whether drainage conditions are satisfactory, whether a good tilth or seed-bed can be obtained, whether the soil is deep enough to permit of adequate root development, and so on. It is not possible, however, by mere inspection to tell beforehand if the soil contains all the food materials needed to grow a good crop. On land which has been under cultivation for years, experience, together with a knowledge of the past history and behaviour of a field, is a very useful guide, but even on such land there may be doubt as to how much lime, if any, should be applied, or how much or how little of a particular fertiliser will be needed. On land that has not been under regular cultivation it is, of course, even more necessary to find out as much as possible about the soil before deciding on the treatment to be given. It is to this aspect of the problem, the determination of the manurial and lime needs of the soil and to similar problems of immediate practical importance, that soil research in war-time has been mainly directed.

In the determination of the manurial requirements of a soil it is to the estimation of the proportion of plant-food material present in a form which is available to plants that attention has to be given. The procedure usually adopted involves the carrying out of field experiments on different types of soil at various centres. After examination of samples of soil from the experimental areas by different laboratory methods, a selection is then made of those

methods which give the best correlation with field behaviour. The field data serve as a check on the arbitrary laboratory data, and are essential as a background for the interpretation of advisory analyses. Soil analyses are not of course infallible, but, following the above general procedure, it is possible in the great majority of cases to obtain by means of soil tests information which is of direct value to the farmer in the liming and manuring of his land. In Scotland a soil-testing service is provided free of charge to farmers by the Colleges of Agriculture in Edinburgh and Glasgow for the east, south, and west of the country, and by the Macaulay Institute, in conjunction with the North of Scotland College, for the north. In view of the need at all times, and particularly in war-time, for using to the best advantage the supplies of lime and fertilisers available, farmers should not hesitate to avail themselves of this soil-testing service.

LIME, PHOSPHATE, AND POTASH IN THE SOILS OF THE NORTH OF SCOTLAND.

From the results obtained on some of the advisory samples which have been examined at the Institute, a comparison has been made of the lime, phosphate, and potash contents of soils from arable rotation land and old grassland in the North of Scotland. On the basis of their plant-food contents the soils have been grouped as satisfactory, slightly low, or low in relation to the needs of the rotation of crops which is commonly followed in the district—viz., cereals, turnips, potatoes, hay, and pasture. A separate grouping of the soils has also been made according to their parent rocks, and some typical results are given in Table I.

Lime.—Lime deficiency is very widespread in both arable rotation land and old grassland. From the figures given for soils of all geological formations it will be seen that only about 3 per cent do not require lime and some 35 per cent are either low or very low. Although the percentage of soils with satisfactory lime contents is low in all the geological groups, the geological origin of a soil does have an influence on its lime content. Thus in soils derived from basic igneous rocks only about 20 per cent fall into the low group, whilst in soils derived from slates and shales the figure rises to 44 per cent in old grassland and 50 per cent in arable rotation land.

Phosphate.—Phosphate deficiency is much more pronounced in old grassland than in rotation land, but even in the latter there is widespread need for phosphate. Whereas 59 per cent of the grassland soils examined are low or very low in phosphate, the corresponding figure for rotation land is 35 per cent. From the table it will be seen that, as with lime deficiency, the phosphate position is least unsatisfactory in soils of basic igneous origin. Soils which have been derived from slates and shales and quartz-rich rocks are particularly liable to be deficient in phosphate.

Potash.—The general picture in regard to the potash contents

TABLE I.

Grouping of advisory soil samples according to their contents of lime, phosphate, and potash.

R = arable rotation land; G = old grassland being ploughed for cropping.
The figures under the various heads are percentages of the samples examined.

Geological Origin.	No. of Samples examined.	Lime.						Phosphate.						Potash.					
		Satisfactory.			Slightly low.			Satisfactory.			Slightly low.			Satisfactory.			Slightly low.		
	R.	G.	R.	G.	R.	G.	R.	G.	R.	G.	R.	G.	R.	G.	R.	G.	R.	G.	Low or very low.
All formations, excluding peat .	6369	1441	3	2	61	64	36	34	17	9	48	32	35	59	14	36	71	56	15 8
Acid igneous rocks .	2772	696	3	2	58	64	39	34	15	7	58	36	27	57	15	36	69	57	16 7
Acid sandstones (O.R.S.)	1273	252	6	6	67	61	27	33	24	9	48	34	28	57	12	30	73	58	15 12
Slates and shales .	1180	216	1	0	49	56	50	44	2	3	26	14	72	83	16	49	75	47	9 4
Basic igneous rocks .	937	206	1	2	80	77	19	21	36	27	44	37	20	36	14	26	72	60	14 14
Quartz-rich rocks .	181	71	7	3	50	62	43	35	8	4	33	21	59	75	13	48	72	46	15 6

of the soils is essentially the opposite of that obtaining for phosphate. Old grassland soils are generally richer in potash than are soils of rotation land. Although only 14 per cent of the rotation and 36 per cent of the grassland soils have satisfactory potash contents, the majority are only slightly low, and the percentage figures for soils with low potash contents are considerably less than the corresponding figures for soils low in phosphate. From the table it will be seen that the risk of potash shortage is least in the soils formed from slates and shales, and is slightly greater in those of basic igneous origin than in the others.

Results for peat soils have not been included in Table I.; the majority of these, however, are low in lime, phosphate, and potash. The above general findings in regard to the lime, phosphate, and potash contents of soils in the North of Scotland are well borne out in practice and are in general agreement with findings for other parts of Scotland—*e.g.*, those of Dr A. M. Smith [1] for the Edinburgh College area, and Professor D. N. McArthur for the West of Scotland College area.

In war-time, when supplies of fertilisers are restricted, the limited amount of potash has to be reserved for certain crops such as potatoes, flax, &c., which have high potash requirements. On most soils other crops are not likely to suffer unduly if, during an emergency, little potash in artificial form should be available for a few years. This is particularly true of land which is being dunged in rotation (1 ton of well-made farmyard manure contains the equivalent of some 15 lb. potash). The need for lime and for phosphate is widespread, and, under the acid conditions obtaining in the vast majority of the soils, it is probable that nothing like full benefit is being derived from the plant-food materials which are either present in the soil or added in manures. Under present conditions the supplies of phosphate available are likely to be inadequate to meet the real needs of our soils, but there are in Scotland abundant deposits of limestone and calcareous shell sands which, if developed and applied to our land, would increase its productivity enormously. As a rough guide to the amount of lime needed for the soils in the area, it is estimated that of the 97 per cent which are in need of lime about half would require dressings of anything up to 20 cwt. calcium oxide or its equivalent per acre, whilst on the remainder dressings upwards of 25-30 cwt. per acre could be applied with advantage.

GENERAL EFFECTS OF LIME ON CROP YIELD.

Although the beneficial effects of applying lime to acid or sour land are generally recognised, many farmers are apt to underestimate the full benefits of liming and the importance of maintaining the lime supplies in the soil at a satisfactory level. As an illustration of the direct effect that lime may have in increasing crop yields, details are given in Table II. of the results obtained in liming experiments at three centres in Aberdeenshire and Kincar-

dineshire. The farms in question are typical of much of the land in the north, and were selected as having average rather than abnormally low lime contents. At all three centres the soil is derived from glacial drift formed mainly from basic igneous rock (diorite) at Centre 1, and from acid igneous rocks (granite and gneiss) at Centres 2 and 3. The average yield figures are all expressed as cwt. per acre, and refer to fresh weights of turnip roots, dry weights of grain and straw for the cereals, and dry weights of hay.

TABLE II.
Effects of Lime on Crop Yields.

Treatment.	Average yields as cwt./ac.			pH values and readily soluble lime contents of soil 18 months after application of lime.	
	1939. Turnips.	1940. Barley (Centres 1 and 2); Oats (Centre 3).	1941. Hay.	pH.	% calcium oxide (CaO).
<i>Centre 1.</i>					
No lime . . .	313	40	34	5.55	0.19
10 cwt. CaO/ac. . .	352	52	41	5.82	0.24
25 do. . .	349	57	42	6.22	0.35
55 do. . .	349	60	43	6.71	0.56
<i>Centre 2.</i>					
No lime . . .	311	47	35	5.51	0.16
10 cwt. CaO/ac. . .	350	56	43	5.84	0.20
20 do. . .	350	61	46	6.27	0.28
50 do. . .	352	63	45	6.78	0.41
<i>Centre 3.</i>					
No lime . . .	212	48	41	5.38	0.21
12 cwt. CaO/ac. . .	222	52	48	5.68	0.28
30 do. . .	215	54	50	6.27	0.36
60 do. . .	206	59	53	6.68	0.52

To ensure the presence of adequate supplies of the common plant foods, the whole of the experimental area at each centre was given dressings of nitrogen, phosphate, and potash for each crop. Experimental dressings of lime were applied at light, medium, and heavy rates, and each treatment was repeated four times. The effects of the different dressings in decreasing the acidity and increasing the contents of readily soluble lime in the soil are evident from the figures for pH value¹ and per cent CaO in the table.

At all three centres turnips were grown in the first season after the application of the lime dressings; it will be seen that at Centres 1 and 2 lime has given an increase of some 12 per cent in yield, but at Centre 3, where damage by turnip-fly was unfortunately considerable and where the turnips had to be resown

¹ On the pH scale a value of 7 indicates neutrality, values above 7 indicate alkalinity, and values below 7 indicate acidity, the lower the value the greater being the degree of acidity.

rather late in the season with consequent reduction in the yield of all the plots, the lime has had no effect. With cereals in the second season yield increases from the light, medium, and heavy dressings respectively amount to 21, 41, and 49 per cent in barley at Centre 1; 18, 29, and 34 per cent in barley at Centre 2; and 8, 14, and 23 per cent in oats at Centre 3; whilst with hay in the third season increases of from 20 to 30 per cent have been obtained.

It is evident that on these soils the increases in yield obtained in the second and third seasons after the application of the lime not only pay for the lime but provide a substantial profit. There is the further point that the lime is by no means exhausted in the first three years. In the fourth season after the application of the lime Centres 1 and 3 were in pasture, for which no yield data could be obtained. At Centre 2 a second hay crop was harvested, and average yield increases of 17, 24, and 35 per cent over those for the unlimed plots were obtained following the light, medium, and heavy dressings respectively. It is thus clear that the lime is continuing to have a beneficial effect in the fourth season after its application, a result which is borne out by observations on the pasture of the other liming experiment areas. It is hoped to continue observations at these centres over a further period of years with a view to obtaining as complete data as possible on the residual effects of the lime dressings.

Forms of Lime and Amounts to apply.—Practically all agricultural lime is applied either as oxide (burnt lime) or as carbonate (ground limestone, by-product limes, &c.). Many farmers are of the opinion that lime, if it is to be effective, must be in the form of the oxide, and there appears to be a considerable amount of prejudice against the use of carbonate of lime. There is abundant experimental evidence to show that, provided equivalent amounts of lime in the two forms are used (*e.g.*, 35 cwt. carbonate of lime is equivalent to 20 cwt. burnt lime), the actual form in which lime is applied to the land is immaterial. In this connection it may be noted that in America the main form of agricultural lime is ground limestone and not burnt lime; there, too, it is found that very fine grinding of the limestone, which of course adds to the cost, is not necessary. Ground limestone has several advantages over burnt lime—*e.g.*, it is non-caustic and does not harm men, horses, or harness, and it can be stored readily without risk of fire. Since the beginning of the war the Geological Survey has re-examined the limestone resources of Scotland, and analyses from all the principal deposits have been made at the Macaulay Institute. From the results already published [2] it is evident that there are many sources of excellent limestone throughout the country. If the lime deficiencies in our soils are to be overcome there will have to be an enormous increase in the amount of lime produced, and one of the most obvious ways of doing this would appear to be the production of ground limestone at many of these centres with a view to having local sources of supply wherever possible.

The actual dressing of lime to be applied depends on various factors, such as the soil pH value and lime content, the texture of

the soil and the crop rotation, and without a knowledge of these it is not possible to give specific recommendations. It must be remembered, too, that the application of lime to a soil which does not need it, or the application of too heavy a dressing of lime, may do actual harm. Overliming tends, for instance, to render certain elements such as manganese, boron, and iron in the soil unavailable to plants, and may thus increase the risk of diseases such as grey speck in oats, crown root in sugar-beet, raan in swedes, and general lime-induced chlorosis in many plants. Any farmer who is contemplating liming and who is not quite certain about how much to apply would be well advised to have his soil tested beforehand.

EFFECT OF PHOSPHATE ON CROP YIELD.

During the past few years a number of experiments have been carried out to study the effect on crop yield of phosphate applied at light, medium, and heavy rates on phosphate deficient soils. Most of the experiments have been carried out with superphosphate and basic slag, which are our commonest sources of phosphate, but attention is also being paid to various other materials likely to be of value as fertilisers. That the application of phosphate to a phosphate deficient soil has a markedly beneficial effect on crop yields may be seen from the results in Table III., where crop yield data are given following the application of experimental phosphate dressings at centres in Aberdeenshire, Morayshire, and

TABLE III.

Effects of Phosphate on Crop Yield. Average Yields as cwt. per acre.

Treatment.	1st Season.			2nd Season.			3rd Season.		
	Turnips.			Barley.		Oats.	Hay.		Oats.
	Centre 1.	Centre 2.	Centre 3.	Centre 1.	Centre 2.	Centre 3.	Centre 1.	Centre 2.	Centre 3.
No phosphate .	234	185	255	39	45	43	41	34	32
Light basic slag .	315	238	311	49	50	52	41	35	34
Medium basic slag .	342	252	300	54	57	46	41	39	34
Heavy basic slag .	358	274	354	57	64	53	45	39	39
Light superphosphate .	341	262	300	48	51	48	43	38	32
Medium superphosphate .	359	283	307	52	58	50	45	39	32
Heavy superphosphate .	381	290	370	56	60	51	44	38	33

Ross-shire respectively. In these areas basal dressings of lime, nitrogen, and potash were applied where necessary according to the results of preliminary analyses, and the experimental phosphate dressings were 2, 4, and 8 cwt. superphosphate per acre respectively and equivalent amounts of phosphate in the form of high soluble

basic slag. Each treatment was repeated five times, and the average yields, which are expressed as cwt. per acre, refer to fresh weights of turnip roots, dry weights of grain and straw for the cereals, and dry weights of hay. At all three centres the soil is derived from glacial drift, which overlies granites and gneiss at Centre 1, schists and gneiss at Centre 2, and Old Red Sandstone at Centre 3.

From the results in Table III. it will be seen that, in the first season after the application of the experimental dressings, large increases in the yields of turnips have followed the application of phosphate. These increases range from about 20 per cent with the light superphosphate dressing at Centre 3 to upwards of 60 per cent with the heavy superphosphate dressing at Centre 1, and at all the centres the increases in yield more than pay for the phosphate. It is to be noted that the amount of response obtained decreases as the dressings are increased, and on these phosphate deficient soils the application of even a light dressing of phosphate gives a relatively large increase in yield. At Centre 1, for instance, yield increases over the control, no phosphate, of 46, 54, and 63 per cent respectively follow the application of 2, 4, and 8 cwt. superphosphate per acre—i.e., the first 2 cwt. give a much bigger relative yield increase than the second 2 cwt. After the turnips were grown no further application of phosphate was made, but yield data for the subsequent crops of cereals and hay were determined to obtain information on the residual effects of the phosphates. It will be seen that in the second season both barley and oats derive considerable benefit from the phosphate originally added; in the third season the yield increases over the control are, as could be expected, much smaller, but the heavier dressings still appear to have a definite residual effect. As regards the relative merits of superphosphate and basic slag, the former appears to be slightly superior in the first season, but the basic slag tends to have a slightly greater residual effect than the superphosphate. The results generally serve to emphasise the beneficial effects which follow the application of phosphate to phosphate deficient land, and support the view that as a source of phosphate there is little to choose between superphosphate and high soluble basic slag. The heavy dressings have, of course, a greater residual effect than the light dressings, but on these phosphate deficient soils the application of even a light dressing of phosphate gives a marked increase in yield. In war-time, when it is necessary to concentrate on immediate returns rather than on building up reserves, it is desirable, if supplies are restricted, to distribute the amount available as fairly as possible consistent with soil and crop needs.

Phosphate Fixation.—On many soils it is found that much of the phosphate added as fertilisers may be converted into forms which are largely insoluble and unavailable to plants. This process, which is commonly referred to as phosphate fixation, is one with important practical implications, and a special study is being made of the problem. Attention so far has been paid mainly to a study of the extent to which common methods of determining

available phosphate account for the phosphate added and agree with field response, and it is evident that further work on the subject is needed. Special attention is also being given to the study of the effect of lime on phosphate fixation. Although lime cannot take the place of phosphate, the application of lime to an acid soil brings about a marked improvement in the general soil conditions, and on land which is deficient in both lime and phosphate it is especially desirable to apply lime if the phosphate supplies are restricted.

Fertiliser Placement.—In different parts of the world, and notably in America, attention has recently been given to the study of combined seed-fertiliser drills, by means of which a fertiliser can be placed in a band or bands in close proximity to the seed. These results indicate that placement of the fertiliser in this way enables the plant to utilise it more efficiently, and, as a result, a considerable saving in the amount of fertiliser required may be possible. So far, apart from the work of Lewis [3], this problem has received comparatively little attention in this country, but further experiments which are at present in hand should provide useful information on the subject. On soils with a high capacity for fixing phosphates the placement of phosphatic fertilisers in close proximity to the seed might be expected to prove particularly beneficial.

Time of Application of Fertilisers and conditioning of Fertiliser Mixtures.—An account of experiments on this subject has already been published [4], and the main findings may be summarised briefly as follows:—

From a comparison of autumn and spring applications of phosphate it is concluded that on average agricultural land superphosphate (as well as other forms of phosphate) can be applied in autumn or winter with little if any risk of its efficiency being reduced.

As a conditioning agent in fertiliser mixtures a peat litter of sphagnum-cottongrass origin has proved much superior to ground mineral phosphate, ground dolomite (magnesium limestone), or sand.

THE MANURIAL VALUE OF POTASH IN BIOTITE-SCHIST.

In peace-time most of our supplies of potassic fertilisers were imported from Germany, and on the outbreak of war the question of utilising available supplies of potash to the best advantage became one of great importance. There was also an obvious need for examining carefully all materials which might possibly be of value as a source of potash. Farmyard manure, seaweed and other organic manures, and wood ashes are all relatively rich in potash, and the value of such materials as fertilisers is well known. Various workers have from time to time investigated the fertilising value of different potash minerals, but the results generally have not been promising. In most minerals in which it occurs potash is

present as relatively insoluble silicates, and these break down in the soil only slowly, the amount dissolved in any one season being generally too small to be of much value to an agricultural crop. From experiments on the Continent it appeared that the potash in biotite is more readily soluble than that in most potash minerals, and on the suggestion of Dr L. R. Wager, Lecturer in Geology at Reading, it was decided to investigate the manurial value of the potash in a crushed biotite-schist. Various experiments have been made with this material, which was obtained from a quarry in Aberdeenshire, but reference to the results obtained in a field experiment which was laid down in 1940 and which is still in progress will serve to give a general idea of its value as a source of potash.

At the centre chosen for the field experiment the soil is formed from drift over diorite, and preliminary analyses showed it to be relatively low in and likely to respond to the application of potash. The experiment aimed at the comparison of the following five treatments on unlimed and limed portions of the area :—

- A—control, no potash.
- B—100 lb. potash (K_2O) per acre from sulphate of potash.
- C—50 lb. potash (K_2O) per acre from the crushed biotite-schist.
- D—100 lb. potash (K_2O) per acre from the crushed biotite-schist.
- E—250 lb. potash (K_2O) per acre from the crushed biotite-schist.

Analysis of the biotite-schist showed that it contained potash equivalent to 3 per cent K_2O , and the dressings applied were calculated on this basis. The five treatments were randomised in five blocks on unlimed (pH 5.95) and limed (to pH 6.75) portions of the experimental area, and basal dressings of nitrogen and phosphate were applied to all the plots to ensure the presence of adequate supplies of the major plant nutrients other than potash, the one under investigation. The area has to date been cropped as follows : 1940, turnips ; 1941, oats ; 1942, hay. The average yields obtained for each treatment are given in Table IV., where the figures, expressed as cwt. per acre, refer to fresh weights of turnip roots, dry weights of grain and straw of oats, and dry weights of hay.

Turnips.—From the data given for this crop it will be seen that the soil is markedly deficient in potash, and, in the absence of lime, sulphate of potash gives an increase in yield of approximately 38 per cent ; the heavier biotite-schist dressings also give useful increases, but are inferior to the sulphate of potash. The yields are all increased by liming, and in the presence of lime the relative response to the application of potash is less ; this may possibly be associated with the mobilising of native potash in the soil by the lime. In the limed plots sulphate of potash gives the highest yield, and the light dressing of biotite-schist is practically without effect. It is of interest, however, to note that the lime, plus the heavy dressing of biotite-schist, gives a yield similar to that obtained with sulphate of potash on the unlimed soil.

Oats.—There is comparatively little difference in the yields of grain + straw in the unlimed and limed strips, the balance being

if anything slightly in favour of the former. It will be noted, however, that in both the unlimed and limed plots the heavy biotite-schist dressing (treatment E) shows a considerable residual effect, which is appreciably greater than the effects of the sulphate of potash and the lighter schist dressings.

TABLE IV.

Average Crop Yields, cwt. per acre, in Biotite-schist Manuring Experiment.

Treatment.	1940 Turnips.		1941 Oats.		1942 Hay.	
	Unlimed.	Limed.	Unlimed.	Limed.	Unlimed.	Limed.
A—control, no K_2O .	269	320	34.6	34.0	19.8	25.7
B—100 lb. K_2O (from K_2SO_4) .	370	391	38.2	37.0	25.1	31.0
C—50 lb. K_2O (from biotite) .	301	328	37.8	37.4	22.6	26.9
D—100 lb. K_2O (from biotite) .	329	345	40.4	37.4	27.0	30.6
E—250 lb. K_2O (from biotite) .	334	367	43.3	42.4	36.6	39.2

Hay.—The most noticeable feature of the results obtained in the third season after the application of the experimental dressings is the marked increase in yield produced by the heavy dressing of biotite-schist—viz., approximately 85 per cent increase in yield in the unlimed plots—whilst lime and the heavy biotite dressing gives a yield roughly double that in the plots with neither lime nor potash. It is thus evident that the heavy dressing of biotite-schist has now supplied a considerable amount of potash to the plants. When treatments B and D, equivalent amounts of K_2O in the two forms, are compared it will be seen that the residual effect of the biotite is slightly greater than that of the sulphate of potash in the absence of lime, and essentially the same in the presence of lime. It is to be remembered, however, that the potassium sulphate which gave the highest yield return in the first season is still giving an appreciable yield increase. A comparison of the relative effects of treatments B and D over the three-year period shows that in the presence of lime the balance is still in favour of the potassium sulphate, but in the absence of lime it appears that the greater initial benefit derived from the potash in soluble form is gradually being offset by the greater residual effect of the less soluble form.

It is not proposed at this stage in the investigation to detail the comparative costs of the various treatments. One of the obvious disadvantages of the biotite-schist used in these experiments is its low percentage of potash, necessitating the crushing and transporting of large quantities of material. If a deposit containing, say, 7 per cent potash were found, its development

for agricultural purposes might well prove worth while. The main interest attaching to the results outlined above lies rather in the finding that such a material does have a certain manurial value. In an emergency, therefore, if no other source of potash were available, the application of crushed biotite-schist, and lime if necessary, might well prove useful.

TRACE ELEMENTS.

In the foregoing, attention has been directed mainly to general problems of liming and manuring—i.e., to problems connected with the major plant foods, nitrogen, phosphate, potash, and lime—which are required by plants in relatively large amounts. There are, however, many other substances, the so-called trace or minor elements, which are essential either for the health of the plant or for the health of the animal consuming the crop, but which differ from the major plant foods in being required only in very small amounts. In ordinary pasture, for instance, there may be about 200 times as much potash as manganese present, but a supply of both is necessary in the soil if the plant is to grow successfully. In certain pastures pinning in stock may result from the absence of adequate amounts of the element cobalt, in spite of the fact that in many healthy pastures the proportion of cobalt in the dry matter is less than 1 part in 5,000,000.

Within recent years the application to soils of modern methods of spectrographic analysis has added greatly to our knowledge of the part played by trace elements in the nutrition of plants and animals. This subject may be dealt with conveniently under the following heads :—

1. Trace element deficiencies affecting the growth of plants.
2. Toxic effects on plants resulting from the presence of excessive amounts of trace elements in the soil.
3. Trace element deficiencies or excesses which may or may not affect the health of the plant, but which affect the health of the animal consuming the plant.

(1) *Trace Element Deficiencies affecting the Growth of Plants.*—In various parts of England, especially on newly ploughed fenland and on many lime-rich soils in Kent and in the south-western counties, crop failures due to manganese deficiency have been reported. In Scotland there are not, so far as is known, extensive areas deficient in manganese at all comparable with those occurring in England. In various coastal areas, especially in the north where there are extensive deposits of calcareous sand, cases of 'oat-sickness,' which may be associated with a lack of available manganese in soils which have been overlimed, have been reported. In most of these, however, the application of top-dressings of sulphate of ammonia, which has a local acidifying effect in the soil, has been effective as a cure.

Raun in swedes and crown-rot in sugar-beet are two diseases

usually to be associated with boron deficiency. Raan in swedes, which, as was shown by O'Brien and Dennis [5], can be prevented by the inclusion of a small amount of borax, generally some 20 lb. per acre, in the fertiliser mixture, appears to be fairly common in various districts in Scotland. Where deficiencies in these or other trace elements are suspected it is important not to overlime the soil, as the presence of an excessive amount of calcium generally tends to aggravate a trace element deficiency and to induce a chlorosis in the plant.

It may well be that there are in Scotland instances of trace element deficiencies affecting crops which have not yet been recognised as such. In general, however, Scotland appears to be fortunate in not being afflicted with extensive areas in which crops are seriously affected by trace element deficiencies.

(2) *Excess of Trace Elements in the Soil.*—Cases of crop injury or crop failure resulting from the presence in the soil of abnormally large amounts of a given element are rare, but not unknown. In the course of advisory work it was found, for instance, that in portions of two fields in a district in East Aberdeenshire all crops failed completely, although the remaining portions of the fields in question gave quite good yields. Spectrographic examination of the soil, which was of basic igneous origin, showed that its contents of readily soluble nickel and copper were about 100 times those normally found. The effects of various dressings of lime and phosphate on one of the areas are meantime being observed, and preliminary results suggest that the application of a suitable lime dressing will prove effective in restoring the fertility of the soil.

(3) *Trace Elements and the Health of Animals.*—Numerous instances of trace element deficiencies having an adverse effect on animal health have been recorded in different parts of the world, and notably in New Zealand and Australia. In Scotland the most striking example of this type of deficiency is provided by cobalt, a shortage of which has been shown to be responsible for pining in sheep in various parts of the country [6, 7]. During the past few years joint investigations on this problem have been carried out on various farms in the northern counties of Scotland by the Macaulay Institute and the Animal Diseases Research Association. Accounts of this work have already been published [8, 9], and the main results to date may be summarised as follows:—

Preliminary analyses indicated that on a number of farms where pining occurs the soils had low contents of cobalt, and it was decided therefore to study the effects of varying dressings of cobalt applied as a fertiliser ingredient. Periodic examination of the soil and herbage by spectrographic and chemical methods and controlled grazing experiments were carried out on differently treated areas. It was found, for instance, that in one area the application of 2 lb. cobalt chloride per acre raised the total cobalt content of the soil from 2.9 to 3.2 parts per million, the readily soluble cobalt content of the soil from 0.20 to 0.25 p.p.m. and the cobalt content of the pasture from 0.12 to 0.51 p.p.m. The results

from the grazing experiments show that pining in lambs due to cobalt deficiency can be cured and prevented by top-dressing the herbage with a cobalt-rich fertiliser supplying about 2 lb. cobalt chloride or cobalt sulphate per acre. Although these salts are rapid in their action their effects last for a considerable time; even after two years they have quite a marked residual effect.

Before applying a cobalt-rich fertiliser it is important to make sure that a deficiency in cobalt actually exists. In one experiment, for instance, where pining in cattle had been reported but not definitely attributed to cobalt deficiency, it was found that the pasture had an unusually high molybdenum content, and the application of cobalt as a fertiliser caused an appreciable increase in the molybdenum content of the herbage. Since the occurrence of teart in cattle has been shown by Ferguson, Lewis, and Watson [10] to be associated with high molybdenum contents in pasture, caution should therefore be exercised in the use of cobalt-rich fertilisers on soils in which the molybdenum content is high.

Other aspects of the above general investigation which are still in progress concern the uptake of cobalt and other trace elements such as copper, molybdenum, and nickel by different pasture species. It has been found, for instance, that perennial ryegrass and red clover will take up more cobalt from a given soil than will cocksfoot or timothy. On land where pining due to cobalt deficiency occurs the selection of a suitable seeds mixture may thus prove to be a factor of some importance.

SUMMARY.

1. A brief outline is given of the general methods used in the determination of the manurial and lime requirements of soils; by means of such methods it is possible in the great majority of cases to obtain information which is of direct value to the farmer.

2. The general position in regard to the supplies of lime, phosphate, and potash in Scottish soils is discussed. Deficiencies in lime and phosphate are widespread and are much commoner than potash deficiency. Stress is laid on the need for applying much more lime, and it is emphasised that there are in Scotland abundant deposits of good quality limestone, which if developed and applied to the land would increase its productivity enormously.

3. Instances are given of marked increases in crop yield following the application of lime, and general aspects of liming are discussed.

4. Details of crop yield increases obtained with phosphate applied at light, medium, and heavy rates are given, and the results are discussed in the light of present conditions when only limited supplies of phosphatic fertilisers are available.

5. Reference is made to problems of phosphate fixation in soils, fertiliser placement, time of application of fertilisers, and the conditioning of fertiliser mixtures.

6. Experiments which are being carried out to determine the value as a fertiliser of the potash in a crushed biotite-schist are described.

7. Attention is drawn to problems involving the examination of the trace element contents of soils and produce, with special reference to cobalt deficiency and pining in stock.

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DISEASES OF THE SHEEP.

A GENERAL DISCUSSION.

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INTRODUCTORY.

IN Britain the major diseases of the sheep have been systematically investigated for little more than twenty years. That period begins with the establishment of the Animal Diseases Research Association in Scotland in 1920. Since then our knowledge of sheep diseases has made quite remarkable advancement. It is true that the loss suffered year after year by British Agriculture from diseases of live stock is still very great, and that a large part of it occurs because Veterinary Science does not as yet know how it can be prevented; but much of the loss is due to the fact that many flockmasters are still unaware that there now exist means whereby several serious diseases that affect their stock can be rationally controlled and, indeed, completely prevented.

Diseases due to external and internal parasites form a very important group. They are not discussed here because, among other reasons, the prevailing circumstances require that this paper must be brief; but, because it is very desirable that knowledge of sheep diseases should be widely disseminated, the writer has attempted to discuss, as concisely and lucidly as may be, a number of the more important of the diseases of the sheep that are known to be due to infection by living agents (bacteria and viruses), and also some of those that are directly caused by functional or 'metabolic' disturbance.

VACCINE AND SERUM THERAPY.

A number of infectious diseases of the sheep can be controlled by rendering the animals immune by artificial means—so-called 'Vaccine and Serum Therapy.'

Active Immunity.—When an animal is inoculated with an infective agent or its toxin it may develop in its tissues specific 'immune bodies' or 'antibodies' capable of rendering inactive that particular infective agent or toxin which excited their production, and thus the animal develops an *Active Immunity*. Of course, if the toxic factor be inoculated in relatively large amount or in highly virulent form, actual disease and not immunity may result, although if the animal survive it may have then acquired immunity. In several instances, however, it is possible to modify the toxic factor so that

it is rendered incapable of producing disease but is still able to stimulate the production of immune bodies. Such a preparation is known as a **VACCINE**.

Vaccines are principally employed for the purpose of *preventing* disease. The active immunity they produce is developed only after an interval which varies considerably, but is usually of about one to two weeks' duration. Once the production of antibodies is started, however, these are usually continuously present in the body for prolonged periods, and indeed a condition of active immunity may persist throughout the life of the animal.

Passive Immunity.—When an animal has been actively immunised by the repeated injection of progressively increasing doses of a particular infective agent or its toxic product, and if then the process be further continued, a very high degree of immunity may be obtained. The blood **SERUM** of such an actively immunised animal is rich in specific antibodies, and, if it be injected into a susceptible animal, that animal is rendered immune to the particular disease. It will be observed that such immunity is not actually produced by, but is gifted to, the second animal. This is known as *Passive Immunity*.

Passive immunity is established immediately after the immune serum is injected, but it is of transient duration. It is commonly effective for a period of only ten to fourteen days, and usually disappears within one to two months; the disappearance of passive immunity is due to the elimination of the antibodies from the animal organism.

Immune sera are employed for the *prevention* of disease, in which case the serum is injected some few days before, or immediately after, exposure to infection. In certain diseases immune sera are also used in *curative* treatment, for which purpose they are injected in relatively large doses as soon as possible after the appearance of the clinical symptoms.

Examples of the use of vaccines and sera are discussed under lamb dysentery at p. 18.

The following diseases are discussed at the pages indicated:—

	Page		Page
Lamb dysentery	17	Pine	27
Pulpy kidney disease	19	Solway pine	29
Enterotoxæmia	20	Swayback	29
Braxy	20	Double scalp	30
Scrapie	21	Lambing sickness	31
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Tick-borne fever	26	Photosensitisation	35
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LAMB DYSENTERY.

Lamb dysentery is a highly contagious disease affecting young lambs during the first or, less usually, during the second week of

life. The disease has probably occurred for many years in localised areas, particularly in the Border counties, but it has increased seemingly in virulence and certainly in extent, especially during the last twenty-five years.

Cause.—The causal organism is a bacterium known as *Clostridium welchii* (type B.), and infection appears to occur only by the ingestion of the specific microbes.

Conditions of Occurrence.—Often the disease exists on affected farms in low incidence for two or three years, but later, the incidence markedly increases, and upon occasion 50 per cent of the lambs may be lost. In infected flocks usually only a few lambs are attacked in the early part of the lambing season, but, as this continues, the disease appears in more virulent form and in much higher incidence. The pastures become contaminated from the excrement of the affected lambs, and adult sheep may act as bacilli carriers.

Symptoms.—In acute cases the lamb is dull, lags behind the ewe, and refuses to suck; the abdominal wall is tense and painful on pressure, and diarrhoea is invariably present. The excreta, which are yellow at first, may later become chocolate coloured, and may even contain unaltered blood. The disease almost always terminates fatally after a course of one to three days.

Post-mortem Findings.—In very acute cases inflammation is present in greater or less degree and extent throughout the bowel, and may be associated with necrotic ulceration of its lining membrane. In less acute cases ulceration of the small and, less commonly, the large bowel is pronounced, and ulcers measuring up to one-quarter inch in diameter, or large necrotic patches, may be present.

Prevention.—No method of cure is known, but two specific means of prevention can be employed:—

1. *Vaccination of the Ewe.*—In this method the ewes are vaccinated shortly before the lambs are put out, and again about a fortnight before lambing commences. By this means the ewe obtains an active immunity which, however, is not transmitted to the developing foetus; indeed the lamb at birth is readily susceptible to the disease. Immune bodies (antibodies) are, however, highly concentrated in the colostrum (the first milk) of the ewe, and the lamb obtains a passive immunity so soon as it begins to suck. The immune bodies continue to be absorbed by the lamb for at least the first four days after birth. There is evidence that in succeeding years the ewe requires to be vaccinated only once, preferably about a fortnight previous to lambing.

2. *Serum Injection of the Lamb.*—A hyper-immune serum is injected subcutaneously into the newly born lamb as soon after birth as possible. By this means the lamb receives a passive immunity that renders it immune for one or two weeks, and thus protects it during the period of susceptibility to infection.

Each of these methods affords adequate protection against lamb dysentery.

On hill farms the vaccination of the ewe is largely practised,

because the conditions under which lambing is carried out render difficult, if not impossible, the satisfactory injection of lambs with serum shortly after their birth.

PULPY KIDNEY DISEASE.

Pulpy kidney disease usually affects lambs in thriving condition when they are about six or eight weeks old; it also occurs, but less frequently, in lambs from three months old onwards.

Cause.—The disease is due to an ubiquitous microbe, *Clostridium welchii* (type D.), closely related to that which causes lamb dysentery; it is capable of rapidly proliferating and of producing a specific toxin in the contents of the bowel.

Conditions of Occurrence.—The disease is frequently associated with the 'flush' of grass in the spring. The milk secretion of the ewe increases at this time, and it is assumed that the increased intake of milk—rich in protein—predisposes the lambs to attack. It has also been observed that when the ewes are transferred from relatively poor to richer pastures this also appears to predispose to the occurrence of pulpy kidney disease in the lambs.

Symptoms.—The symptoms are those of marked dulness, quickly followed by prostration, but the course is very short; indeed, a lamb that is apparently in perfect health in the evening may be found dead on the following morning.

Post-mortem Findings.—The term 'pulpy kidney disease' is derived from the fact that the kidneys rapidly disintegrate after death. Another striking feature of the disease consists in the marked distension of the heart-sac with fluid, usually yellow or yellowish-red in colour.

Diagnosis.—The occurrence of sudden deaths in thriving lambs of a few weeks of age—especially when louping-ill and pyæmia can be excluded—should raise very strong suspicion that such deaths are due to pulpy kidney disease. The disease can be definitely diagnosed by laboratory test.

Prevention.—Lamb dysentery serum may contain *Clostridium welchii* (type D.) antitoxin; if so it may afford some degree of immunity against pulpy kidney disease. Such serum, however, cannot be relied upon because the immunising effect of an anti-serum generally disappears in about ten or fourteen days after injection, while pulpy kidney disease does not usually occur in lambs until they are at least several weeks old. A specific pulpy kidney antiserum is prepared; and while this affords adequate protection, the flockmaster is frequently unable to decide whether the use of such a serum is an economic measure, because the incidence of the disease in a given flock varies very markedly from year to year, and when the disease makes its appearance the flockmaster does not know whether his losses will be serious or merely confined to a few lambs.

* ENTEROTOXÆMIA.

Cause.—The term 'enterotoxæmia of sheep' is used with reference to a disease caused by the absorption of the specific toxin of the same microbe as that which causes pulpy kidney disease in lambs (*Clostridium welchii*, type D.).

Conditions of Occurrence.—The affection appears to be identical with pulpy kidney disease, but occurs in older sheep—particularly in those in good condition. As has been already indicated, the organism appears to be widespread throughout the country, and, indeed, it is prevalent on many pastures on which sheep are known to have grazed for long periods of time without their showing observable illness. As in pulpy kidney disease, enterotoxæmia occurs particularly when sheep are moved from a relatively poor to a rich pasture. The reason for this is not known, but it has been assumed that sudden access to a diet comparatively rich in protein predisposes the sheep to the disease; even if this assumption be in fact true, the nature of the action of the predisposing factor still remains obscure. Particular farms may experience the disease only at rare intervals over a period of many years.

Symptoms.—As in the case of pulpy kidney disease, the course of the illness is of very short duration; an animal which appears perfectly healthy at a shepherd's routine inspection may die from enterotoxæmia within a few hours.

Post-mortem Findings.—On post-mortem examination the changes found are usually indefinite and irregular.

Diagnosis.—A provisional diagnosis may be made upon consideration of the history of the flock movements. Diagnosis is, to some extent, simplified if one can exclude braxy, to which enterotoxæmia bears some resemblance because of its sudden attack and its very short and fatal course; but precise diagnosis is dependent upon laboratory tests.

Prevention.—When the disease occurs in sheep which have recently been moved on to a relatively rich pasture they should, if possible, be returned to their original pasture and re-introduced to the new grazing for only two to three hours each day over a period of a week or so before being permitted to graze it continuously.

Specific anti-pulpy kidney serum may be employed as a preventive, but its use is limited by the same considerations as are discussed under pulpy kidney disease.

BRAXY.

Cause.—Braxy, or 'sickness,' is due to the ingestion of a microbe known as *Clostridium septique*.

Conditions of Occurrence.—Braxy commonly attacks hogs, especially those in thriving condition. The disease is confined principally to hill grazings, and the majority of cases occur in the autumn and winter. Climatic conditions appear to play some

considerable part in the production of the disease, and the association of the occurrence of braxy with hoar-frost is well recognised.

Symptoms.—The course of the disease is so short that affected sheep are usually found dead, but, if seen during the short period of observable illness, there is considerable swelling of the abdomen, accompanied by signs of abdominal pain.

Post-mortem Findings.—On post-mortem examination an inflammatory patch on the lining membrane of the fourth stomach is usually evident, and signs of extensive inflammation may be occasionally present in the stomach and small intestine. An excessive quantity of yellowish or reddish coloured fluid may be found in the abdominal cavity. The carcass putrefies rapidly and soon becomes distended with gas.

Prevention.—It has been found that infection can be prevented by vaccine prepared from an artificial growth of the specific microbe, inactivated by formalin.

When the vaccine is injected under the skin the sheep develops a protective active-immunity about fourteen days after the inoculation. The vaccination, therefore, should be carried out shortly before the commencement of the seasonal occurrence of the disease. On farms where the disease is virulent it may be advisable to vaccinate twice, allowing an interval of fourteen days to elapse between the inoculations.

SCRAPIE.

The disease of sheep known in Scotland as scrapie represents a neurosis, characterised by symptoms of intense and progressive itch, progressive debility, and locomotor inco-ordination.

Cause.—The causal factor is a living infective agent, the precise nature of which has not yet been determined, although there is evidence that it is a filtrable virus (see p. 25). The infective agent is known to be located in the brain, the spinal cord, and the spleen. The disease can be transmitted through the medium of the pasture, by congenital infection through either parent, and experimentally, by intracerebral and subcutaneous inoculation. The incubation period is very prolonged; it appears to extend from about eighteen months to two or three years, or even longer.

Conditions of Occurrence.—In this country sheep are the only animals known to be susceptible, and the breeds most commonly affected are the Border Leicester and its crosses, the Half-breeds (Border Leicester : Cheviot cross), and the Cross Suffolks (Suffolk : Half-bred cross). It also frequently occurs in pure Cheviots. Other breeds are not immune to the disease, but its incidence in Scottish Blackfaces is remarkably low. Scrapie also relatively rarely occurs in the Border Leicester : Blackface cross—the so-called Greyfaces or Mules.

Scrapie is very seldom observed in sheep under eighteen months of age, but there appears to be no maximum to the age incidence, and cases of the disease in nine-year-old sheep of both sexes have been recorded.

As has been indicated, scrapie can be transmitted congenitally through the medium of either the ram or the ewe, but the infective parent may itself appear perfectly healthy at the time of mating, and may never, or only after the lapse of several years, manifest the disease, although its progeny may exhibit the characteristic symptoms of scrapie at any period from eighteen months of age onwards.

Symptoms.—The onset of the disease is insidious, and only an experienced shepherd may be able to recognise the earliest signs. The sheep is nervous, apprehensive, and more excitable than usual. If closely watched, there are observed fine tremors extending over the head and neck which cause slight but very rapid nodding movements. If the animal be rounded up it becomes tense with excitement, and fine muscular tremors, particularly affecting the thighs and flanks, are evident. The head and neck are carried high and somewhat stiffly; the facial expression is staring and fixed; the ears not infrequently assume an unnatural position; grinding movements of the teeth are commonly evinced, and thirst is a frequent symptom. There is no diarrhoea, but if the animal be excited, quantities of faeces and urine may be involuntarily passed at short intervals. The fleece becomes lighter in colour and loses its lustre. The bleating is somewhat feeble, husky, and tremulous.

The most characteristic clinical feature is the development of itch which frequently commences in the region of the rump and loins and gradually extends over the whole body. When the skin, particularly that of the back, is rubbed, the 'scratch reflex,' evinced by nibbling movements of the lips and vigorous wagging of the tail, is shown; in many instances the itch becomes extreme, and the animal is unable to rest for any considerable length of time.

Although the appetite remains unaffected almost throughout the entire course, feeding and rumination may be imperfectly performed because of the severe skin irritation. The sheep repeatedly rubs itself against fixed objects, but, apart from the abrasions on the skin and the loss of wool which consequently result, no lesion of the skin is observable. As a result probably of the constant torment of irritation, emaciation and weakness are progressive, and inability to rise is a common feature of the later stages. The temperature throughout the course of the disease remains approximately normal.

There frequently coexist with these symptoms various motor nervous disturbances, including aberrations of gait, epileptiform convulsions, and paralysis of the hind-quarters.

When scrapie attacks a nursing ewe, the lamb appears to be in perfect health so long as it receives a sufficiency of milk. While itch is a characteristic feature of the disease it may be comparatively mild in degree, and in rare instances no appreciable skin irritation is evident. The symptoms tend to increase in intensity throughout the course of the disease. Scrapie is generally regarded as invariably fatal, although upon relatively rare occasions there have been observed cases in which spontaneous and complete recovery apparently took place.

The course of the disease shows marked variation in its duration. Instances are known in which a fatal termination was reached within fourteen days after the first observable signs of illness, but usually the malady is chronic in type, and runs a course of six weeks to six months or even longer before terminating in death.

When the disease is established in a flock the incidence presents wide variation, and commonly falls between 4 per cent and 20 per cent. In some flocks the incidence is so low that only occasional cases occur throughout a period of several years.

Post-mortem Findings.—In diseases that run a chronic course it is to be expected that definite gross tissue damage will result. In this respect scrapie presents a singular exception to the general rule, because, while the course is usually protracted and the symptoms become progressively intense until a fatal termination is reached, apart from the emaciation and the presence of such injuries as may have been induced by the vigorous rubbing of the skin, no gross pathological change occurs in the disease.

Diagnosis.—Scrapie is to be differentiated from parasitic skin diseases, especially sheep scab. In sheep scab several members of the flock usually evince at about the same time various degrees of skin irritation; on the other hand, scrapie is usually manifest in single members of the flock, and that at irregular intervals—that is, scrapie is typically sporadic in occurrence. In scrapie (as has been said) there is an absence of skin lesions other than those occasioned by rubbing against fixed objects, whereas the lesions of scab are usually evident. In all cases of doubt the disease should be reported to a veterinary practitioner or, in outlying districts, to the nearest agent of the Local Authority.

Scrapie can be diagnosed in the laboratory by microscopic examination of certain parts of the brain.

Prevention.—No specific curative or preventive treatment is known. The affected sheep should at once be removed from the pasture. If the sheep be destroyed during the early phase of the disease, before emaciation becomes evident, it is possible that the carcass may be used for human consumption.

CONTAGIOUS PUSTULAE DERMATITIS.

Contagious Pustular Dermatitis or orf is a specific infective disease of the skin, characterised by the formation of vesicles and pustules and possibly also by subsequent purulent and necrotic processes.

Cause.—The cause is a filtrable virus (see p. 25).

Conditions of Occurrence.—Orf usually appears in epizootic form and often spreads throughout a flock with great rapidity. It is commonly observed, however, that a few individuals appear to possess a natural immunity and remain apparently unaffected. In the majority of outbreaks the disease is confined to the lambs and the hogs, while in others it occurs throughout the flock without distinction of age.

Symptoms.—The primary changes develop, after an incubative period of two to four days, on those parts of the skin that are only lightly covered by hair and frequently also on the lining membranes of the natural orifices of the body. The lips, especially in the region of the angles of the mouth, are common sites of infection, and this usually involves the surrounding skin, particularly that between the upper lip and the nostrils. The legs are also frequently affected, in which case the primary lesions are often situated in the hoof cleft, around the coronet, and in the region of the fetlock.

An individual lesion may be first observed as a small vesicle or blister, which rapidly becomes a pustule surrounded by an inflammatory zone. The pustules quickly rupture and their contents dry to form a thick, rough, warty-like brownish crust, which is at first firmly adherent but gradually loosens, and in about a fortnight falls off. If the crusts are prematurely removed the underlying tissues are red, weeping, and very sensitive. In mild cases a spontaneous recovery may result in two or three weeks without evidence of general disturbance, loss of appetite, or lameness. In more severe forms of the disease the lesions tend to spread and become confluent, so that large areas of the non-woolly parts—the head and legs—are involved. On the head the skin round the eyes and on the ears is commonly affected, while the disease also often spreads to the mouth (inner sides of the cheeks, gums, and edges of the tongue). In this type of the disease the lesions do not tend to heal spontaneously, but become the site of secondary invading microbes, particularly those which produce pus and cause necrosis; this results in the formation of ulcers, and of raspberry-like masses of tissue with ulcerated surfaces. Feeding and rumination are rendered difficult, if not impossible; turbid and evil-smelling fluid dribbles from the mouth. Severe lameness may be present as the result of suppurative processes extending between the walls of the hooves and the underlying sensitive tissue. The disease usually persists in the flock for many weeks.

Two important complications may occur; these are gastro-enteritis and broncho-pneumonia, both of which conditions usually terminate fatally. When the mouth is severely and extensively affected, death may occur from inanition (exhaustion from want of food). In young lambs the mortality may reach 60 per cent or even higher; but in the majority of outbreaks it does not exceed 5 per cent. In nursing ewes the teats and udder are frequently affected as the result of suckling affected lambs—and even severe mastitis may develop from this cause. Occasionally the genital organs of both sexes may be affected, but if the condition be uncomplicated by secondary infections such cases are usually relatively mild in character.

Diagnosis.—Foot-and-mouth disease has been mistaken for orf. The two diseases can usually be easily distinguished even on clinical grounds, but should there be any doubt, existence of the disease must at once be reported to a veterinary practitioner, or, in outlying districts, to the nearest agent of the Local Authority.

Treatment and Prevention.—The lesions may be dressed with

mild antiseptic and astringent lotions for the purpose of controlling secondary infections, but apart from this little can be done to expedite healing. In suppurative conditions of the feet portions of the horny capsule may require to be removed and antiseptic dressings applied.

At the commencement of an outbreak the disease may be largely controlled by observing cases during their earliest phase and removing them to a separate pasture.

A preventive vaccine, prepared from the virus, has been used with considerable success. It should be applied about two months before the flock is exposed to the risk of infection, if that be known. The vaccine does not possess curative properties.

LOUPING-ILL.

Louping-ill, or 'trembling,' has been recognised for the last one hundred and fifty years as the cause of serious losses in sheep stock.

Cause.—The cause of louping-ill is an ultra-microscopic, filtrable virus—that is, a virus so minute that it cannot be rendered visible by the most powerful microscope, and is capable of being filtered through unglazed porcelain. The virus is transmitted from sheep to sheep through the medium of the tick, *Ixodes ricinus*, which in its larval or nymphal stage acquires virus by sucking blood from an affected sheep and then transmits it to a healthy sheep which it bites in its subsequent nymphal or adult stage respectively.

Conditions of Occurrence.—The disease in its occurrence appears to be peculiar to Scotland and Northern England. In Scotland it is prevalent throughout the North-Western and Central Highlands, and in the southern uplands from South Ayrshire to the Tweed.

It was early recognised that louping-ill occurred only on land which was infested with the sheep-tick, and this, in conjunction with the fact that its seasonal incidence bore relationship to the periods of maximum tick activity—April, May, early June, and again in September—led to the assumption that the tick transmitted the disease.

The farm animals most susceptible to the natural disease are sheep and cattle; swine and also horses are occasionally the subjects of attack.

Symptoms.—In sheep exposed to natural conditions of infection a period of six to eighteen days may elapse between the time of infection and the appearance of the first signs of illness. The early stage of the disease is characterised by dulness and fever, and during this stage the virus multiplies in the blood. At about the fifth day of infection, however, the virus may attack the cells of the central nervous system, and this is quickly followed by symptoms of excitability, tremor—especially of the head—muscular spasms, and irregularity of gait. Balance may be affected, and the sheep may become unable to stand. In the later stages paralysis of one or more limbs or of the hind-quarters may develop.

The nervous symptoms differ markedly in individual cases;

frequently spontaneous recovery occurs during the early phase without affection of the nervous system.

Post-mortem Findings.—No gross characteristic changes can be observed at the post-mortem examination of an affected carcase.

Diagnosis.—The symptoms of several different disease conditions, including lambing sickness, bear considerable resemblance to those of louping-ill and great difficulty is often experienced in reaching even a provisional diagnosis of the disease in an individual case in the field; indeed, under such conditions, a precise diagnosis is often impossible. The occurrence of a number of deaths in sheep which have recently been moved on to tick-infested pastures from 'clean' land should cause one to suspect louping-ill. Diagnosis, however, can be very precisely determined by laboratory examination and tests. The head and a considerable portion of the neck of a suspected case should be forwarded to a veterinary laboratory without delay.

Treatment and Prevention.—No specific curative treatment is known, but, if affected sheep are kept in sheltered, quiet surroundings and carefully nursed, the chance of recovery is definitely increased.

Louping-ill can be effectively prevented by the use of vaccine prepared from the virus, and by this means the incidence of the disease on many farms has been reduced to a negligible figure. In flocks in which louping-ill vaccination has not previously been practised it is advisable to vaccinate the whole sheep stock (with the possible exception of young lambs) at least once. In succeeding years one of the following alternatives should be followed:—

- (a) The hogs should be vaccinated about a fortnight before they return from wintering, or about the beginning of March if they are wintered at home. The gimmers should also be vaccinated about the beginning of March.
- (b) In order to prevent the losses from louping-ill which, on some farms, occur in the autumn, it has been found beneficial to vaccinate, in August, the ewe lambs kept for breeding stock, and these again as hogs in the spring.

Since the vaccination of young lambs is attended by some degree of risk, it is not generally recommended. Research is in progress for the purpose of evolving specific preventive measures which, while safe for young lambs, may afford adequate protection against the disease.

General preventive measures include the control of ticks by dipping and other means.

TICK-BORNE FEVER.

Cause.—The cause of tick-borne fever is now believed to be a minute, microscopic parasite (a 'Rickettsia-like body'), which can be demonstrated in certain of the white blood corpuscles. As in the case of louping-ill, the disease is transmitted by the bites of infected nymphal and adult ticks. The blood of affected sheep

remains infective for prolonged periods; consequently the great majority of ticks on infected pastures are likely to harbour the causal microbe, and thus probably every sheep on such pastures becomes the subject of the disease.

Conditions of Occurrence.—Tick-borne fever had long remained unrecognised as a specific disease of sheep because, being tick-borne, it has the same geographical distribution and the same periods of seasonal occurrence as louping-ill, with which it was consequently confused.

Symptoms.—After an incubative period of about one week symptoms of dulness develop, and these are accompanied by a high degree of fever and considerable loss of physical condition. The febrile symptoms are irregular and may be prolonged, but commonly subside after a period of about ten days. They are, however, usually succeeded by several recurrences. The sheep eventually develop an immunity or, perhaps rather, a tolerance to the disease, and so possess an 'acclimatisation value.'

The economic importance of tick-borne fever largely consists in its reducing the bodily condition and the general health of the flock, and in its rendering the infected sheep, particularly lambs, more susceptible to other diseases.

Post-mortem Findings.—No characteristic changes at post-mortem examination are recognised, although enlargement of the spleen may occasionally be observed.

Diagnosis.—A precise diagnosis can be obtained only by laboratory tests; these consist in the inoculation of experimental sheep with the blood of suspected cases of the disease.

Prevention.—No satisfactory method of prevention by means of vaccines or sera has yet been evolved.

PYÆMIA IN LAMBS.

On many tick-infested farms lambs of about fourteen days to one month old suffer from pyæmic infections, characterised by abscess formation in various parts of the body and by septic inflammation, particularly of the joints. The cause of this condition is known to be due to various strains of a microbe (*Staphylococcus aureus*). It is believed that infection occurs through the medium of tick-bite, and although no specific remedy is at present available methods of prevention are now under investigation. It is known that many lambs suffer simultaneously from louping-ill, tick-borne fever, and pyæmic infections, and therefore, if for no other reason, the problem of tick control is an urgent one. The application to newly born lambs of anti-tick salves has proved of considerable value as a preventive.

PINE.

The term 'pine' or 'vinquish' has been applied generally to a number of disease conditions, characterised by progressive debility, that affect young sheep and cattle; such conditions

include round-worm infestation, Johne's disease, and also mal-nutrition.

Cause.—The disease here discussed is a mineral deficiency resulting from a lack of cobalt in the pasturage.

It had been shown that 'pine,' a disease of young sheep and cattle which occurred in the Inner Hebrides, was closely similar to, if not identical with, a disease in New Zealand named 'bush sickness,' because, apart from other considerations, both affections could be prevented and cured by the administration of crude iron compounds. Later investigations by Australasian workers afforded evidence that 'bush sickness' was in fact due to a deficiency of cobalt. It may reasonably be inferred that the beneficial effects of crude iron compounds in pine are due to the fact that they contain minute quantities of cobalt as an impurity.

Symptoms.—The symptoms of pine are those of a progressive debility, accompanied by anæmia and emaciation. The onset is frequently insidious. The affected animal is dull, and the fleece becomes dry, lustreless, and broken; the visible mucous membranes, especially those within the eyelids, are pale; the physical condition is gradually lost, the eyeball becomes sunken, and there is commonly a watery discharge from the eyes. In lambs, growth is markedly retarded, and they soon present a stunted, unthrifty appearance; thereafter anæmia and emaciation develop and progress, and finally as the result of extreme weakness the animal is unable to rise. In severe cases the gait is stilted and somewhat inco-ordinated. In many instances the symptoms are aggravated by a superimposed round-worm infestation, but unless the infestation be a heavy one diarrhoea is not often evinced.

The symptoms described are those of the acute type of pine, but it is to be understood that the condition frequently manifests itself in much less acute form, and the gradations in the intensity of the symptoms are presumably due to the various degrees of cobalt deficiency which obtain in different pastures. In many instances the condition may be such that it can more properly be described as that of a low grade of health rather than one of definite disease.

Post-mortem Findings.—The post-mortem findings are usually those of anæmia and emaciation.

Diagnosis.—Since the symptoms of cobalt-deficiency-pine and those of worm infestation present many similarities, and since both conditions are also frequently associated, it is often very difficult, if not impossible, to form a precise diagnosis at the first examination of the flock; but a history, over a period of years, of the regular occurrence of a debilitating disease affecting a considerable number of the flock is suggestive of cobalt deficiency.

The mapping-out of a cobalt deficient area may be made with the help of the soil chemist. Failing a precise diagnosis, if cobalt pine be in fact present the administration of the mineral to the pining sheep should quickly effect a marked curative response.

Treatment and Prevention.—Experimental evidence has now been obtained that pine, in so far at least as it affects certain

parts of Scotland (true cobalt-deficiency pine), can be treated with complete success by the administration of cobalt alone. Mineral licks and mineral mixtures containing cobalt in adequate quantity are prepared commercially. Crude iron oxide may also be used in a mineral mixture or may be mixed with concentrates at the rate of 1 to 1½ lb. iron oxide to each hundredweight.

More recent experimental evidence indicates that cobalt sulphate when applied as a top-dressing to cobalt deficient land even in relatively minute quantities (2 lb. to the acre) can render such land cobalt adequate, and that this treatment effectively prevents the occurrence of pine. The cobalt can conveniently be applied mixed with a top-dressing of superphosphates. It is conceivable, therefore, that large tracts of country in which pining, in varying degree, has been prevalent for long periods of time can be converted into healthy grazings. There is evidence, however, that indicates that such treatment should be applied only to land known to be cobalt deficient.

SOLWAY PINE.

A peculiar form of pine occurring on the granite areas in the region of the Solway Firth appears to be distinct from that due to cobalt deficiency. There is some evidence that the disease is associated with a deficiency of magnesium and potassium, and experiments are now in progress to determine the value of feeding mixtures containing these minerals in high concentration.

SWAYBACK.

Swayback is a serious nervous disorder affecting young lambs.

Cause.—It is now recognised that swayback is due to a progressive destruction of the white matter of the brain, but the actual cause of the disease is unknown; it is evident, however, that swayback is in some way associated with defective mineral metabolism, because the administration of small amounts of copper to pregnant ewes prevents the appearance of the disease in their lambs, although, so far, there is no proof that the affected grazings are deficient in copper, and there also appears to be no deficiency of copper in the tissues either of the ewes or of their affected lambs.

In the present state of our knowledge it is assumed that for some reason the developing foetus is unable to utilise the copper in the maternal blood.

Conditions of Occurrence.—In many cases the disease is evident at birth, and about six weeks of age appears to represent the latest period at which it becomes manifest. There is marked variation in the degree of severity; the most severe attacks are usually those which occur during the earliest days of life. The disease has a wide distribution throughout the country, but it is particularly prevalent in certain districts; in several of these it may even be regarded as a regular annual occurrence.

Swayback occurs in lambs of all breeds, born from ewes of all ages, and both sexes are equally susceptible. It has been observed that the disease most commonly affects lambs that are the progeny of ewes which have lived in swayback areas for a period of at least one year. A 'single' lamb, one or both of twins, or one, two, or all of triplets may be affected.

Symptoms.—The symptoms are those of ataxia evinced by very marked irregularity of gait consisting in stumbling and blundering movements, which may be so marked that the lamb is quite unable to walk and remains decumbent unless lifted to its feet, when, after a few inco-ordinated and quite ineffectual attempts to walk, it again falls down. Less severe cases are capable of walking, although with difficulty, and mild cases may show only a slight inco-ordination of movement of the hind limbs which may not be detected until the animal is hustled or otherwise unusually disturbed. In a number of cases blindness has been observed. The disease is not associated with fever.

The duration of the course is very variable. Many acute cases live only a few hours. In less acute cases the course may range from a few days to several weeks. Recovery is never complete, but in cases that are mild in character the progress of the disease may become arrested, and such cases may live for several years and may even bear healthy lambs.

Post-mortem Findings.—In less acute cases of swayback there may be no obvious evidence of disease on post-mortem examination; in more acute cases an examination of the brain may reveal diffuse gelatinous degeneration of the white matter, while in severe cases the white matter may be completely liquefied.

Diagnosis.—A history in a particular flock of the annual recurrence of a paralytic condition in young lambs, in conjunction with the changes found in the brain in severe cases, is so characteristic that the diagnosis usually presents little difficulty.

Prevention.—Curative treatment is not possible, but the disease can be effectively prevented by permitting pregnant ewes, throughout the entire period of gestation, to have easy access to salt licks containing 1 per cent of copper sulphate.

DOUBLE SCALP.

The condition known as 'double scalp,' 'double scaup,' or 'scappie' appears to represent a generalised defective formation of bone.

Cause.—The cause is at present obscure, but there is evidence that suggests that double scalp may arise from some form of phosphorus deficiency.

In the great majority of cases the disease is associated with heavy infestation of round-worms, but this very probably should be regarded as consequent upon the debilitated condition of the animal and not as an essential factor in the cause of the disease.

Conditions of Occurrence.—Double scalp principally occurs on

the poorer hill grazings in Northumberland, Cumberland, and Yorkshire; it also occurs on certain hill farms in Scotland; but the distribution of the disease has yet to be more fully and more precisely determined. The disease is commonly observed in lambs at or shortly after the time of weaning, but may affect young growing sheep of any age, and it occasionally occurs in breeding ewes, in which case it is considered that the animals may have been affected as lambs, and that, after partial recovery, the condition has again developed under the strain of pregnancy and lactation.

Symptoms.—The affected animal presents an unthrifty appearance and the fleece becomes lustreless and 'broken' in character. The visible mucous membranes are anæmic, and a watery discharge from the eye is usually evident. Some degree of dropsical swelling may be present about the region of the lower jaw. The frontal bones of the skull are thin, and they yield and may easily fracture upon pressure.

The condition continues throughout the winter months when hill grazings are most sparse and are poorest in quality. Should the affected animal survive the winter season a marked amelioration of the symptoms may occur with the advent of spring grass.

Post-mortem Findings.—The post-mortem appearances are those associated with anæmia and debility. The body cavities contain varying amounts of dropsical fluid; the heart muscle is pale and flabby and there is an absence of fat throughout the body.

The long bones are abnormally light and fragile in appearance, and in extreme cases their specific gravity is reduced; they, however, do not appear to be softer than normal, do not show distortion, and there is little tendency to fracture easily. The flat bones are considerably reduced in thickness, and consist of very delicate and porous tissue covered by an extremely thin layer of compact bone. In the frontal bone (in which the condition can be readily recognised during life) the thinned outer and inner layers of compact bone are relatively widely separated by soft spongy tissue; hence the name 'double scalp.'

Diagnosis.—While it is possible to reach a diagnosis on consideration of the clinical symptoms, this can be made with greater precision by a post-mortem examination of an affected animal.

Prevention.—There is an old and widespread belief among shepherds that if the outer layer of the frontal bone be fractured the sheep is likely to recover; this practice is both irrational and useless.

The affected sheep should be removed from the hill to a sheltered grass park, and a supplementary ration of hay and concentrates allowed.

LAMBING SICKNESS.

Lambing sickness is an acute functional disease of the nervous system affecting the pregnant and the lactating ewe.

Cause.—It is now known that milk fever in the cow is due to an acute fall in the concentration of blood calcium, and that the

injection of assimilable calcium salts effects a rapid and complete recovery from this disease. The condition known as lambing sickness in the ewe has been shown to be closely allied in its nature and causation to milk fever in the cow.

Conditions of Occurrence.—As distinct from milk fever, however, in which the attack usually manifests itself within the first three days after calving, lambing sickness not infrequently appears shortly before lambing, especially if the ewe is subjected to undue exertion and fatigue, such as may be occasioned by overdriving, rail or road transport, &c.; it also commonly affects ewes with young lambs at foot.

Symptoms.—In the primary phase of the attack the symptoms are those of spasm of certain muscles of the trunk and legs accompanied by considerable excitement and general distress; these symptoms may, however, be slight and transient and they are usually very quickly followed by the comatose phase, in which the ewe lies completely prostrate and insensible. A fatal termination may result within twenty-four hours. If the ewe be unattended and acute distension of the abdomen develop during coma, asphyxiation may be the immediate cause of death.

Post-mortem Findings.—On post-mortem examination no lesion has been regularly recorded.

Diagnosis.—Lambing sickness in its clinical symptoms bears some resemblance to pregnancy toxæmia, and it is only in recent years that the two conditions have been clearly distinguished on clinical and pathological grounds.

Pregnancy toxæmia is not known to occur after lambing. When lambing sickness occurs in the pregnant ewe the disease is almost invariably associated with over-exertion and fatigue; whereas pregnancy toxæmia usually occurs in ewes which do not receive sufficient exercise. Lambing sickness, not infrequently, has been mistaken for louping-ill (p. 26).

Treatment.—The application of calcium therapy by a veterinary practitioner almost invariably results in recovery, so rapid and complete that it can be described as spectacular.

PREGNANCY TOXÆMIA.

Pregnancy toxæmia or 'twin trembling' is an acute functional disorder affecting ewes during the last few weeks of gestation; it is almost invariably confined to those carrying twin or triplet lambs.

Cause.—The cause of pregnancy toxæmia is still obscure, but there is evidence which suggests that it arises as the result of a defective and therefore incomplete combustion of fats by the body tissues. As a result certain toxic substances (ketone bodies) which are products of incomplete fat metabolism are produced, and are absorbed by the tissues. In the present state of our knowledge it is therefore assumed that pregnancy toxæmia is an auto-intoxication.

Conditions of Occurrence.—The disease is often associated with periods of very inclement weather, especially when snow lies on the ground. In such conditions sheep are often hand-fed with hay or concentrates, and tend to remain in the vicinity of the feeding places and thus do not take the exercise to which they are accustomed in grazing. It is assumed that this lack of exercise may result in the incomplete combustion of fats with consequent toxæmia. It has been suggested that a form of pregnancy toxæmia results from a deficiency of protein in the diet, but this waits confirmation.

Symptoms.—The symptoms are those of dulness, uncertain, even staggering gait, the bowel movements are sluggish and may be entirely suspended. The appetite is almost completely lost, but the temperature remains approximately normal. Fine tremors appear over the head and neck and may become general. The disease is very frequently associated with the presence of acetone in the blood, and the smell of acetone in the breath is often readily noticeable. In the course of a few days the ewe is unable to rise, and finally becomes progressively comatose. Death usually results in the course of one to six days.

Post-mortem Findings.—The liver is somewhat enlarged and is abnormally pale in colour; this is due to the presence of fatty infiltration. This condition is frequently found in healthy parturient ewes, but is particularly evident in the disease under discussion. As has been mentioned, twin or triplet fetuses are almost invariably present.

Diagnosis.—The disease may be suspected in consideration of its conditions of occurrence, but can only be diagnosed precisely by the chemical examination of the blood of affected ewes (see also lambing sickness).

Treatment and Prevention.—In pregnancy toxæmia—as distinct from lambing sickness—the blood calcium content is relatively normal, and no satisfactory curative treatment is at present known; it has been recognised, however, that ewes which lamb, or abort, during the course of the illness make a rapid recovery.

As a preventive treatment it has been recommended that during the last few weeks of pregnancy the ewes should be exercised by driving them slowly but continuously for a distance of about a mile each day. The feeding of succulent roots is also advised as being of distinct preventive value.

ENZOOTIC ABORTION.

On certain hill farms in Scotland there occurs an enzootic form of abortion in ewes (so-called 'kebbing') that is of very considerable economic importance, and appears to be distinct from the contagious forms of ovine abortion that occur in various parts of England. These are primarily due to infection with one or other of two micro-organisms named *Vibrio fetus* and *Salmonella abortus ovis*. The enzootic abortion about to be described is also distinct from the abortion that may follow severe malnutrition and also

from that which sometimes occurs when pregnant ewes are folded on turnips, particularly under conditions of prolonged wet weather.

Cause.—The cause of enzootic abortion is at present unknown. Since, so far, there has not been discovered evidence of bacterial infection, and because of the conditions of occurrence, it is at present considered that the disease may not be an infective process, but that its cause may more probably be represented by some environmental factor such as dietary deficiency or the presence in the pastures of a toxic substance.

Conditions of Occurrence.—The disease is widely distributed throughout the lower hill grazings, but appears to occur particularly in certain well-defined 'abortion areas' comprising groups of adjoining farms. In these areas the disease has occurred annually for long periods of time. The percentage abortion rate on different farms shows very considerable variation. On some farms it is no more than 5 per cent; on others 10 per cent or even 20 per cent and occasionally as many as 30 per cent of the ewes may abort.

The disease is almost wholly confined to hill grazings, but its occurrence does not appear to be associated with any particular type of pasture. It is commonly believed that a long period of cold weather in early spring, resulting in backward vegetation, is a predisposing factor; but the disease occurs under widely varying conditions of weather, and these appear to be of little, if any, significance in its causation.

It has been observed that on some farms the greater proportion of abortions occurs in the gimmers; on others the incidence is approximately equal among all ages of the ewe flock and no immunity appears to be developed in the ewes that have aborted; indeed particular ewes are believed to have aborted at several successive pregnancies, but precise information on this matter has yet to be obtained. It is, however, the general experience that as soon as the most mature ewes, which are cast at about five years old, are removed to non-affected areas they do not again abort. It has been considered that the practice of 'wintering away,' and also of feeding the ewe flock on concentrates throughout the period of pregnancy, tends to reduce the abortion rate, but the evidence on this point is of a very conflicting nature.

Although the disease is largely confined to definite locations, there is evidence that it is extending in its geographical distribution, because farms upon which enzootic abortion formerly had not been known to occur have become affected during recent years. This fact, by itself, appears to suggest that the cause is a living infective agent, but (as has been stated) when considered as a whole the evidence indicates that the disease arises from a non-infective process.

Symptoms.—The act of abortion is not usually attended by injurious effects on the ewe. Quite frequently the abortion occurs about the third month of pregnancy, and may not then be observed. It is only when the ewes are handled shortly before the lambing season is due to commence that the shepherd discovers that they are no longer pregnant. When abortions occur later in pregnancy

the affected ewes may show no abnormal sign other than the presence of a slight sanguineous discharge at the vulva. On certain farms the great majority of abortions occur during the last few weeks of pregnancy, in which case retention of the placenta is common. In severely affected flocks even the lambs that are carried full term are weakly at birth and do not thrive.

Diagnosis.—The annual occurrence of abortion in considerable incidence on a particular farm over a long period of years is in itself strong evidence of the existence of non-contagious enzootic abortion, and bacteriological and serological examinations will distinguish the disease from *Vibrio fetus* and *Salmonella abortus ovis* infections.

Prevention.—In a series of extensive controlled field experiments extending over several years no significant reduction in the abortion rate on affected farms was effected by the administration of minerals, vitamins (A, D, and E), or of proteins, and means by which the disease can be prevented are at present not known.

PHOTOSENSITISATION.

Photosensitisation, 'yellowes,' or 'head greet,' is a disease of sheep characterised by inflammation of the skin, particularly that of the head and face; associated with marked subcutaneous infiltration, and frequently with an extensive necrosis of the ears. The disease is also commonly characterised by a generalised yellowish discoloration of the body tissues.

Cause.—It is well known that animal tissues become abnormally sensitive to the ultra-violet solar rays when they are under the influence of certain substances known as fluorescent compounds; these, upon occasion, occur in certain plants. Herbage plants containing fluorescent compounds appear in themselves to be harmless, because although animals that ingest them are rendered 'photo-sensitive' this condition of photo-sensitisation is not manifested unless such animals are exposed to bright sunlight.

In certain foreign countries several specific plants have been shown to be definitely concerned in the production of photo-sensitisation, but in Britain no particular plant or plants have so far been incriminated, although yellowes is very frequently associated with pastures rich in leguminous plants. The disease has also been observed when sheep are folded on rape, but in certain seasons it quite commonly occurs on permanent hill grazings.

Conditions of Occurrence.—From what has been said it will be understood that the disease usually occurs during the months of June, July, and August, when sunlight is at its maximum.

The condition is very widely distributed throughout the country. It is generally recognised that those breeds of sheep, for example, Suffolks and to a less extent Scottish Blackfaces, in which the hairy parts—i.e., the face and legs—as distinct from the woolly parts of the body, are pigmented, possess a very considerable degree of immunity.

Symptoms.—The initial symptoms are those of congestion,

tenderness, and irritability of those parts of the skin covered by hair as distinct from wool, the head and ears being particularly affected. This is quickly followed by marked subcutaneous inflammatory effusion, resulting in the swelling of the head and face and involving the eyelids, lips, and particularly the ears, which become distorted in appearance and semi-pendulous under the weight of the effused fluid. The nostrils may become partially occluded, with resultant difficulty in breathing. The skin and visible mucous membranes assume a yellowish appearance, and, as the result of the transudation of fluid through the skin, the hair of the affected parts may become matted. Secondary septic infection of the excoriated skin may occur. The general symptoms are those of fever and dulness. There is a marked tendency to necrosis and sloughing of the ears; and although the acute phase of the attack may pass off in a few days' time, the necrotic sores may heal only relatively slowly. Ophthalmia may occur as a complication and a condition of debility may ultimately develop.

The disease is not usually fatal, although in the absence of preventive measures a high mortality may, upon occasion, occur; but because of the reduction in physical condition and of the necrosis of the ears which are commonly associated with severe attacks, the value of the animals may be much reduced.

Post-mortem Findings.—On post-mortem examination enlargement of the liver is observed, associated with a watery infiltration and general yellowish discolouration of the tissues.

Diagnosis.—The symptoms are characteristic, and the fact that a number of cases presenting similar symptoms occur in a flock at about the same time renders diagnosis comparatively easy.

Treatment.—The flock should be immediately removed to another pasture and the affected animals placed in a cool shady enclosure. Mild astringent and antiseptic dressings are applied to the affected parts and a saline aperient administered. In the case of sheep grazing on a suspicious pasture it is recommended, as a preventive measure, that a paste containing charcoal or some other such colouring agent be applied to the skin of the head and legs.

Although the losses occasioned by specific diseases of sheep are very great, it is probable that at least several of them in part depend upon fundamental contributory causes, at present difficult to define, but probably associated with the marked deterioration of hill pastures which so long has been proceeding unchecked. Certainly much loss arises directly from malnutrition, which in the case of large numbers of sheep amounts to *semi-starvation*. The need for hill pasture improvement on a national scale is a clamant one.

SOME MODERN ASPECTS OF POTATO PRODUCTION.

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THE successful and efficient management of the potato crop is, at any time, a matter of national importance, for no other crop grown in Great Britain is capable of yielding so much staple food per acre. There are, however, many factors to be considered if this end is to be achieved and the crop is to produce the maximum return of which it is capable. Outstanding among these is the question of disease control. The potato is probably subject to a wider array of diseases and greater losses from them than any other agricultural plant. Consequently a major approach to improvement in potato production is aimed at increasing productivity by reducing preventable loss, and methods of control have been developed with far-reaching effects on cultural procedure and crop management. These effects have been particularly marked in the production of seed, a branch of the potato industry which in itself has been developed as an empirical form of disease control.

As long ago as the eighteenth century it was recorded that potatoes lost vigour if they were repeatedly propagated from home-grown seed. Diseases were suspected as the cause of this deterioration, but it was generally accepted that these diseases were merely symptomatic of the onset of senile decay. It was observed, however, that deterioration took place more slowly in some districts than in others, and that seed taken from the former areas retained its virility for a spell when grown in a new environment. Although the end was inevitable, the transfer of seed in this manner was so clearly advantageous that the practice became common, and, gathering momentum and gaining direction as the result of experience, it led directly to the establishment of the Scottish seed potato trade.

VIRUS DISEASES.

In these more enlightened times it is common knowledge that potatoes deteriorate not through senility but through the progressive and insidious spread of virus diseases, now distinguished in the field as the leaf-roll disease and various forms of mosaic diseases. During the past twenty years a vast amount of information has been brought to light on the nature of these diseases and their causes, but as yet no completely effective

method of combating them has been found. It is true that immunity from some viruses and a high degree of tolerance to others has been discovered, but no potato variety combining inherent protection from all the common viruses is yet in commercial production, nor has any treatment been devised to prevent virus-affected tubers from giving rise to diseased plants. In these circumstances the established practice of obtaining fresh seed at frequent intervals remains as the basis upon which losses from deterioration can be reduced to minimum values. Considerable improvements in this practice have already been brought about by raising the standard of health in potato stocks intended mainly for seed purposes. In furthering general improvement, the incorporation of health-grading schemes into the structure of seed certification has played a conspicuous part, for it has focused attention on the fundamental necessity of raising, maintaining, and distributing only good, vigorous seed.

Dissemination of Virus Diseases.—Although nearly a score of viruses and virus strains have been reported to attack potatoes in this country, only four call for discussion as the causes of widespread, serious diseases. These are the virus causing leaf-roll disease and the viruses generally referred to as viruses A, X, and Y, which alone or in combination give rise to the common mosaic diseases of varying intensities. Three of these viruses—leaf roll, A, and Y—are transmitted by aphides (green-fly), and their spread is determined largely by the habits and distribution of these pests. The fourth, virus X, can be transmitted by contact, but as yet no insect vector of this virus has been found.

The green-fly most closely associated with virus transmission in Scotland is the potato aphis, *Myzus persicae*. Recent studies have shown that this aphis hibernates on over-wintered swedes, kales, savoys, and similar Brassicæ, and there is good evidence that these crops provide the chief sources from which potatoes become infested in late spring and early summer. At this season a generation of winged green-fly is produced on the winter hosts, and when conditions are suitable for flight—that is, on warm, dry and almost windless days—the winged forms migrate to potatoes, upon which they settle to feed and deposit young. The young aphides thus introduced eventually give rise to several generations of wingless forms. The latter do not remain stationary, and it is by their movement, feeding here on a diseased plant and there on a healthy neighbour, that virus diseases are disseminated within a crop. In late summer and early autumn, when potatoes begin to mature, winged forms are again produced to complete the cycle by returning to the plants which serve as their winter hosts.

Counts of green-fly numbers on potato crops, taken over continuous periods, have indicated that winged forms appear earliest and in greatest numbers in sheltered districts and in the vicinity of urban areas and market gardens. Here, too, they multiply quickly and reach high total populations. It is not surprising, therefore, to find that in these areas aphis-borne virus diseases

spread rapidly and potato stocks deteriorate quickly. In exposed situations, where Brassicæ are not over-wintered and where the climate is more rigorous, aphides have been found to appear late and in small numbers, whilst the total populations have been relatively small. The well-established connection between such areas and the production of vigorous seed is thus explained, for there is little opportunity for aphis-borne leaf-roll and mosaic diseases to spread in them. Growers in these areas have taken advantage of this fact to apply constructive measures in building up and maintaining healthy stocks of both old and new varieties. Deterioration has thus been checked in basic seed stocks, with the result that the general level of health has been raised and the lives of individual varieties have been prolonged.

Control Measures.—Although a favourable environment is an almost essential pre-requisite in seed production, control over virus diseases lies largely in the hands of the individual grower. Green-flies reach all potato crops sooner or later, and virus X spreads readily under all conditions. Active control measures are thus a strict necessity in all crops destined mainly for seed. The first of these is to reduce initial sources of infection to a minimum by planting only high-grade seed—that is, Stock Seed or Grade A Seed—on clean land. Much of the value of good seed is lost, however, if good and indifferent stocks are placed side by side, an observation which, incidentally, applies with equal force to crops grown primarily for ware as well as to those grown mainly for seed. The introduction of insect-borne viruses into a crop is made by winged aphides, which, after feeding on a diseased plant, fly from plant to plant and spread infection in the process of feeding. Consequently diseased plants in one crop are potential sources of danger to neighbouring crops, a point requiring emphasis, for it is apparently not fully appreciated by many growers.

After planting, control measures take the form of roguing out diseased plants wherever they are found, the object being not merely to improve the appearance of the crop, but to prevent the spread of infection and the perpetuation of diseased tubers. For this reason effective roguing starts as early in the year as possible; so that potential sources of infection are removed before their diseases have been widely disseminated. The major spread of virus diseases, as already indicated, takes place within the crop, either through contact or by the movement of wingless aphides from plant to plant. Infection contracted in this manner often fails to show itself in the year in which it is incurred, and a crop which seems healthy after a late roguing may often belie its appearance and fail to reach the standard of health expected of it in the following season. The early removal of diseased plants before contact is made between them and their neighbours and before the green-fly pest reaches its full dimensions is the surest way of reducing the spread of viruses and avoiding disappointing consequences. Early roguing has the further advantage that the labour involved is considerably smaller than that needed if all the work is left to a later stage.

Low, upright haulms are easy to walk through, and the complete removal of diseased plants is a relatively easy task. It is, of course, a matter of elementary precaution to remove both haulm and tubers so that they cannot serve as fruitful sources of disease for the infection of the remaining healthy plants.

All roguing is best carried out in dull weather. Severe types of disease and varietal impurities can be recognised under most weather conditions, but the milder forms of mosaic disease are difficult to detect in bright sunlight. Although roguing during the early stages of growth is the most advantageous, the work should be repeated at intervals during the growing season in order that diseased plants which have appeared late or escaped earlier inspection may be detected and destroyed.

VARIETAL REACTIONS TO POTATO VIRUSES.

Leaf Roll.—Potato varieties differ widely in their reactions to the viruses attacking them, and in this lies the explanation of their differential behaviour in the field. Even the familiar symptoms of the leaf-roll disease, which is common to all varieties, may differ in detail and vary in degree of severity between varieties. In every case, however, the reduction in yield brought about by infection with the leaf-roll virus is severe. Thus in the varieties which suffer least, Up to Date and Great Scot, the reduction is between 40 and 50 per cent as compared with an average reduction of 60 to 70 per cent in varieties such as Arran Banner, British Queen, Dunbar Rover, Dunbar Standard, Eclipse, Epicure, Gladstone, Kerr's Pink, and Majestic. In varieties which are most greatly affected the yield may be reduced by as much as 80 to 90 per cent, as in Arran Pilot, Arran Signet, King Edward, and May Queen. Varieties also differ in the rate at which they become infected, and in this respect Arran Banner, Doon Star, Epicure, Eclipse, and Majestic are relatively resistant, while Arran Consul, Arran Signet, Dunbar Cavalier, Gladstone, and Up to Date are much more susceptible. The latter, consequently, are liable to deteriorate rapidly, and they are not suitable varieties from which to obtain seed in areas where leaf roll is known to spread readily.

Virus Y.—Although this virus is not entirely absent, it appears infrequently in Scottish stocks, and in the light of new evidence there is reason to believe that the most effective aphid carrier of this virus is scarce in Scotland. When newly infected with virus Y many potato varieties show symptoms of leaf-drop streak, a self-explanatory term for the disease. Under conditions where the virus is common and is contracted early, as in many parts of England for example, this disease may bring about severe reductions in yield through the loss of foliage. Varieties which react in this fashion are Duke of York, British Queen, Majestic, Doon Star, and Up to Date. A few varieties such as Arran Crest, Arran Pilot, Champion, Di Vernon, Epicure,

and Puritan, on the other hand, show comparatively little effect in the year of infection, but all varieties in cultivation, irrespective of their primary reactions, show severe mosaic diseases in the year following infection, although again there are differences in the degree of severity. Arran Crest and Arran Pilot appear to contract virus Y very readily, and, as they show little effect in the year of infection, seed of these varieties produced in areas where virus Y is not uncommon is liable to give disappointing results.

Virus X.—The most common virus in Scotland, and indeed in every country where the potato is found, is virus X. When present alone this virus, which exists in several different strains, causes diseases ranging from the so-called negligible mottle to severe mosaic, according to the strain of the virus present and the variety infected. Most of the mild mosaic diseases of the field are due to infection with virus X, and some varieties—Duke of York, Kerr's Pink, King George, Redskin, Up to Date, and Witchhill, for example—are almost invariably infected; while others—such as Arran Banner, Arran Peak, Arran Pilot, Doon Star, Eclipse, Great Scot, and Majestic—are infected to a large extent. This state of affairs is due in large measure to the fact that virus X is disseminated by contact, with the result that it can spread with equal freedom in any environment. Furthermore, the virus has so little visible effect on many varieties that its presence often passes undetected. There are a few varieties, however, which are invariably free. These are varieties which, when infected experimentally—that is, by artificial methods of transmission—react by producing symptoms of a streak disease which kills the affected plant. This disease is rarely seen in the field, and it has been found that if infection is contracted naturally the virus will not permeate the tissues of plants which react with the lethal streak disease. In the rare instance of complete invasion taking place, moreover, the death of the plant brings about a self-elimination of the virus. Varieties which react in this fashion are now known, therefore, as field immune. Field immunity from the common strain of virus X is found in Arran Crest, Epicure, King Edward, Ninetyfold, and the new early maincrop variety Craigs Defiance. That it is a valuable character may be judged from the statistics in Table I., calculated on the results of inspection of the 1938 crop in Scotland. The situation it reveals is relatively unaltered at the present time.

TABLE I.

Varietal reaction to virus X.	Acres.			Per cent.		
	Stock Seed.	Grade A.	Grade H.	Stock Seed.	Grade A.	Grade H.
Field immune	655	10,235	1,928	4.83	75.48	14.21
Susceptible	421	8,833	36,040	0.83	17.53	71.51

These data show convincingly that in normal agricultural practice and in areas environmentally suited to seed production, varieties field immune from virus X can be maintained at a higher standard of health than varieties lacking this characteristic. This is made possible, firstly, by the absence of all diseases of which virus X is the sole or joint cause, and secondly, by the ease with which other diseases are observed and removed in these circumstances. Thus field immunity from virus X bears in its train a more effective control of the aphid-borne leaf-roll and Y viruses, a factor of the greatest importance in limiting the internal and more dangerous sources of infection in stocks destined for areas where aphid-borne viruses are readily disseminated.

Virus A.—This is an insect transmissible virus which when present alone is either carried without symptoms or with the production of a very mild type of mosaic. In common with virus X it is able to bring about a lethal streak on some varieties, and these are consequently field immune from it. Some of the varieties which have this property are Alness, Arran Crest, Ballydoon, British Queen, Craigs Defiance, Doon Star, Duke of York, Dunbar Rover, Dunbar Standard, Eclipse, Epicure, Gladstone, Great Scot, Kerr's Pink, King Edward, Ninetyfold, Redskin, Sharpe's Express, and Up to Date.

The chief significance of virus A is found in its combination with virus X to produce severe mosaic in varieties which are little affected by either virus alone. The greater part of the severe mosaic found in Scotland is due to this combination, and it occurs with particular frequency in Catriona, Golden Wonder, and Immune Ashleaf, since all stocks of these varieties are entirely permeated with virus A. Thus the spread of virus X alone through these varieties is sufficient to cause severe mosaic disease, whereas in most varieties a similar spread of virus X causes mild mosaic only.

Deterioration.—The degree of susceptibility or resistance to the four viruses above mentioned has a profound effect on the length of life of potato varieties. Thus it is not mere coincidence that varieties such as Epicure, Ninetyfold, King Edward, Eclipse, Duke of York, Sharpe's Express, British Queen, and Up to Date, all of which are over forty years old, are still in cultivation, while most of their contemporaries have disappeared. The fact that the first three varieties are field immune from viruses X and A, and that the remaining varieties are field immune from virus A, has undoubtedly contributed to their length of life by conferring a lasting protective effect against deterioration through the spread of severe mosaic diseases. In the varieties which were not so protected, viruses X and A were able to spread freely and, by their nature, bring about deterioration in seed stocks raised in areas where leaf roll and virus Y were uncommon sources of trouble. Recent examples of deterioration in this manner are to be found in Golden Wonder and Majestic. In 1923 Golden Wonder, including its white-skinned variant Langworthy, was at the height of its popularity, but by 1929 the acreage grown had fallen to less than half of its former total, and the variety appeared to be threatened with

extinction owing to an extensive increase of severe mosaic in seed stocks and the consequent reduction in cropping power. Similarly, Majestic, the variety grown most extensively to-day, showed signs of decline about fifteen years ago, when it was reported that most seed stocks were in an unhealthy condition through widespread mosaic diseases. Because of their undoubted merits, efforts were made to resuscitate both these varieties, and success was achieved by the careful selection of mosaic-free plants from which new stocks were built up. By this means these two, and many other varieties in addition, have been given a new and longer lease of life, but, even so, their continued preservation lies entirely in the hands of the seed grower, and it is safe to say that were it not for the increased attention paid to the maintenance of health in their seed stocks they would inevitably have disappeared, and most certainly they would not enjoy their present degree of popularity.

Leaf-roll susceptibility has a quicker effect on the life of a variety than susceptibility to viruses X and A. The disease is caused by a single virus and stocks degenerate quickly when affected, with the result that a highly susceptible variety rarely has a chance of achieving popularity. Modern examples of varieties which have shown promise in other directions but which have fallen short on account of this failing are Arran Consul, Arran Signet, Dunbar Cavalier, and, to a lesser degree, Gladstone. Their lives have been preserved and lengthened by the continuous efforts made to keep seed stocks as clean as possible, as also has been the case with Arran Pilot, which, if untended, deteriorates rapidly with both severe mosaic and leaf roll.

POTATO BLIGHT.

Blight is a disease caused by the parasitic fungus *Phytophthora infestans*; which first attracted attention about a century ago when it was responsible for the destruction of much of the potato crop. Damage was so severe in many localities, and particularly in Ireland where potatoes had become the staple food crop, that famine conditions prevailed. Since then it has been a permanent, if intermittent, scourge waiting only upon suitable conditions to continue its war against the potato.

The amount of damage caused by blight has varied considerably from year to year according to climatic conditions. In the nineteenth century it was epidemic in what was known as the 'Hungry Forties,' and again during the great agricultural depression of the seventies. In 1916, when war-time food production was a major concern of the country, it took a heavy toll of the crop. Since then it has caused severe losses in 1931 and 1936, and less severe in 1938 and 1939. Only occasionally over that period has damage due to it been negligible.

So far as is known, blight infection comes from diseased tubers where the fungus has lived during the winter. There appears to be no true resting stage in its life-cycle, and it does not normally produce sexual or winter spores as do many other fungi. It is

capable of passing the winter in a state of comparative inactivity and of regaining its vitality with the advent of warmer weather. Under mild and damp conditions it will grow and send out branching filaments upon which will form the asexual spores. These spores can be carried by the wind, and should they drift on to a wet potato leaf they will germinate and penetrate the tissue, thus infecting another plant. In a few days the affected parts will blacken and decay, and the fungus will gradually spread into the surrounding green tissue. In damp weather the spore-producing branches will again appear, giving off countless numbers of spores all capable of spreading the disease. This fruiting stage of the fungus can be seen on the surface of the leaf as a whitish fringe surrounding the dead portions of tissue. The fringe is the exposed part of the fungus, and consists of minute branching filaments, each terminating in a seed-like oval spore. Under ideal conditions only twelve hours are necessary to permit sporulation of the fungus, germination of the spores, and penetration of a new leaf. Thus the disease can spread very rapidly throughout a crop. In dry or cold weather the growth of the fungus is retarded, but only to increase again as dampness and warmth return. And so it continues until the end of the season and the ripening of the crops. Meanwhile vast numbers of spores fall to the ground, and those which come in contact with wet tubers may germinate and penetrate the tissue. Here the fungus finds an environment in which it can live throughout the winter and from which it can launch an attack the following year.

One of the oldest opinions concerning potato blight is that young plants possess some resistance and only become susceptible as they mature. It is based on observations that serious outbreaks do not normally occur until the flowering stage. Tests, however, show that no difference in susceptibility of young and older plants exists when environmental conditions suitable for the fungus are provided. In ordinary cultivation young plants are less frequently affected because they are open and erect and dry quickly. Further, the fungus at that time has had less chance of developing to provide the sources of infection. Flowering plants, on the other hand, have heavy foliage which covers the ground and tends to maintain a damp atmosphere underneath. Many growers will have noticed small late plants which are quite dry in the morning growing near to strong earlier plants on which the dew still remains. It is on the latter plants that blight will generally appear first and make the greater progress.

Blight reduces yields in two ways: firstly, by the destruction of the foliage, with consequent cessation of tuber growth; and secondly, by direct infection of the tubers resulting in decay. The former may be fairly serious if infection takes place at a comparatively early stage of growth, but generally the greatest losses occur when tuber rot progresses during storage and large quantities have laboriously to be picked out and destroyed. Since tuber infection usually comes from diseased foliage, control measures are most successfully undertaken during the growing season.

The ideal method of solving the blight problem would be the introduction of immune types, but unfortunately no such varieties have yet proved a commercial success. The wart disease menace was overcome in this manner, but the difficulties associated with blight resistance are infinitely greater. Nevertheless, inherent resistance to blight is a quality as real as wart immunity, and the introduction of varieties possessing it is a prospect for the near future. There were times in the past when agriculture was not at all sure that it wanted blight-resistant varieties, because comparatively blight-free seasons resulted in over-production and crops were a financial failure. A small surplus caused a disproportionate drop in prices, and no doubt these circumstances would have recurred oftener had not blight intervened to wipe out the excess and stabilise the market. The situation has now been entirely altered, and the prospect of an enlightened agricultural policy for post-war years should provide means whereby over-production can be economically countered and reasonable returns ensured to the grower.

Control of Blight.—With nothing but susceptible varieties to choose from, growers can give efficient protection against the ravages of blight by the use of chemical fungicides. About sixty years ago it was found that the merest trace of copper had a lethal effect on the fungus, and since then copper compounds have formed the basis of the treatment. The effect of copper as a fungicide was first observed by Professor Millardet in 1882 in a French vineyard. A mixture of powdered bluestone and lime had been applied to the vines beside a path as a deterrent to pilferers, and these vines were the only ones to escape serious harm from an attack of Vine Mildew. The worthy Professor made extensive tests, and in 1885 Bordeaux Mixture was produced. Two years later the formula for Burgundy Mixture was evolved and published in France. The use of these mixtures as a protection against blight in potatoes followed shortly afterwards.

Bordeaux and Burgundy Mixtures have remained the most effective fungicides so far devised. The method of preparing them has been widely published from time to time, but growers wishing concise details should apply to the Department of Agriculture for Scotland for Growmore Leaflet No. 63: 'Potato Blight on Farms,' or to the Ministry of Agriculture and Fisheries for Advisory Leaflet No. 271.

Since the last war various proprietary compounds have appeared on the market as alternative treatments. Generally speaking, they are more easily prepared and more convenient for the busy farmer, since no elaborate mixing methods are required. Comparative trials have shown that although most of them provide very useful protection, none of them attains the degree of efficiency of Bordeaux Mixture.

Another treatment which is sometimes practised takes the form of dusting with a dry powder. It can give a reasonably good commercial control, but requires twice as many applications as the wet sprays. In order that the powder will adhere to the foliage, dusting

operations should be carried out when the plants are damp. Where a water supply is not available, where sufficient labour is unobtainable, where potato fields are steep and hilly, or where large areas require to be treated in a very short time, the use of dry powders may prove to be the only practicable method. Otherwise, when no such serious obstacles arise, advantage should be taken of the more efficient system of wet spraying.

Growers of large acreages can usually maintain the necessary equipment for their own use, but the smaller producer must rely on contractors or join with neighbours in co-operative ownership. In any circumstances it is important that the available machines be carefully distributed, and, in the event of a wet season, full use be made of them, since they may be the means of saving vast quantities of valuable food.

The best time to begin spraying is a difficult matter to decide and varies from year to year. It should be remembered that the fungus lives within the plant tissues, where it is out of reach of the fungicide, and consequently protective measures should aim at preventing its entry. It is therefore necessary to spray before the spores of the disease arrive, so that they will be killed before they have time to germinate and penetrate the tissue. Blight usually makes its appearance in Scotland towards the end of July, and reports of it are published in the Press. With his local knowledge the farmer will be able to make use of these reports in estimating the danger to his crops and making arrangements for counteracting it. Many growers spray their crops regularly each year as soon as blight conditions seem imminent. They regard the expenditure involved as an annual premium paid to ensure a good yield of sound tubers. Blight may not always arrive, but when paying a fire premium one does not necessarily expect a fire.

Apart from spraying, blight damage may be less severe where good cultural methods are practised. In the first place, the use of sound healthy seed will reduce greatly the possible sources of infection. Later, if the crop should become infected, the disease will probably appear at one or two isolated points, and these areas should be immediately destroyed to prevent the disease reaching epidemic proportions.

It is also advisable to give the tubers a good covering of soil. Tuber infection is caused by spores being washed down from the diseased haulms, and consequently the deeply covered tuber will have the better chance of escaping infection. Drills which have been well earthed up, giving a high sharp top and steep compact sides, give good protection.

Towards the end of the season a certain amount of blight may be in evidence even in carefully handled crops, and while it is there, harvesting should not be attempted except during a period of dry weather. Under damp conditions tuber infection would occur to cause losses during storage. The haulms should therefore be allowed to ripen off or be burned down with sulphuric acid or copper sulphate. In either case harvesting should not begin until at least fourteen days after the plants are dead, since by that

time spores in the soil will have lost their vitality and further tuber infection should not occur.

In crops grown mainly or entirely for seed the advantages of burning down are considerable, and the practice is strongly to be recommended. The treatment, in fact, should be regarded as a necessity to profitable seed production. By neglecting this treatment, losses in a single crop are often greater than the entire cost of the equipment. When carried out at the proper time, spray burning has five important effects, viz. :—

- (1) The maximum yield of seed tubers is obtained because tuber growth is stopped at that point.
- (2) The spread of blight is arrested and infection prevented from reaching the tubers.
- (3) The further transmission of virus diseases by green-flies is stopped.
- (4) Late infections of virus disease are prevented from reaching the tubers.
- (5) Weeds are destroyed, with a consequent reduction in the amount of weed seeds reaching the soil.

The sulphuric acid spray is quicker and more efficient than copper sulphate, but it entails the purchase of a special acid-resisting machine and more careful handling. Treatment with copper sulphate may be carried out with machines built for spraying Bordeaux Mixture.

In contemplating protective spraying or haulm destruction, consideration should be given to the varieties of potato in question. Varieties of 1st- or 2nd-early maturity being grown for immediate consumption generally require no treatment, because blight seldom reaches serious proportion at that time of the year and the problem of storage does not arise. When grown for seed, however, protective spraying may be necessary in areas prone to blight or where planting has been delayed. When the tubers have reached the requisite size for seed purposes growth should be stopped either by cutting the haulms or burning down.

All other varieties except some late-maturing types generally require protective spraying, and seed crops should always be burned down at the appropriate time. Varieties such as King Edward, British Queen, Up to Date, Great Scot, Arran Banner, and Redskin tend to be more seriously affected than others. When spraying commences they should be given priority over varieties like Majestic, Gladstone, Doon Star, Arran Chief, Arran Consul, and Arran Peak, but none should be neglected.

The late-maturing varieties, Kerr's Pink and Dunbar Standard, grow strongly erect, and are generally less seriously affected by blight than those previously mentioned. The need for protective spraying is consequently less urgent, but seed crops should invariably be burned down. Golder Wonder is a late variety with slow-growing tubers, and generally requires protective sprays to prolong growth as far as possible. The tubers, however, are seldom badly

affected with blight, and the crop need not be burned down unless for seed purposes or to expedite lifting.

STORAGE OF POTATO TUBERS.

Success in storing potatoes depends largely upon the condition of the tubers, and therefore upon the efficiency with which the crop has been grown. The art of making pits or clamps generally attains a reasonably high standard, but too frequently the material to be stored is not of the highest quality on account of blight infection and bruising. Sound disease-free potatoes can be stored without difficulty so long as the site is properly drained.

The prevalent method of pitting potatoes on some convenient endrig or spare piece of ground is usually very successful in preserving a crop over winter. There are several drawbacks, however, including the work involved in making the pit, the large quantity of straw required, and the problem of dressing the tubers satisfactorily under the rigorous climatic conditions of winter. This last point is probably the most important, since potato dressing in inclement weather is one of the most uncomfortable jobs on the farm. The work entails some care and concentration, and little of that can be expected from a benumbed and unhappy worker.

These difficulties can be largely avoided by the use of properly constructed potato sheds or by the adaptation of existing buildings to meet the requirements. New buildings can hardly be contemplated in war-time, even apart from the initial expense, but unused cattle courts, stables, and such may readily be improvised where available. Such accommodation is not necessary for crops which are intended to remain in storage over winter, but seed growers and those who market ware during winter would benefit greatly by the added facilities. The buildings should be draught and water-proof, and in them potatoes may be stored to a depth of 3 to 5 feet, depending upon conditions. Only very sound dry tubers of the harder varieties can safely be piled to the higher level. In such buildings potatoes will keep equally well as those stored in pits, provided they are given a good covering of straw. The straw, in addition to permitting ventilation and keeping out frost, tends to maintain a constant temperature and humidity underneath, and so prevents the condensation of moisture on the top layer of tubers.

Under these conditions dressing of the crop can proceed in comfort in any weather, and the provision of artificial light can counteract the shortness of winter daylight. In early spring the accommodation can conveniently be utilised for sprouting seed tubers in preparation for planting.

Taken all over, the standard of dressing is not a credit to the farmer. Too frequently diseased and damaged tubers find their way into the shops, and complaints regarding the condition of seed are not uncommon. Control of blight, more careful handling, and the provision of good dressing facilities should give better results.

A dressing machine with roller conveyors, which turn the tubers over and over as they progress, greatly simplifies the work and improves the sample. But a great deal of bruising and splitting would be avoided if thoughtless workers could be made to realise that potatoes are tender, living vegetables, and should not be treated like coals.

STORAGE DISEASES.

Although blight is the most serious disease affecting tubers in storage, there are others, collectively described as dry-rots, which sometimes cause considerable losses and which may be controlled by fungicides. These diseases do not affect the growing plants, and therefore treatment must necessarily be applied to the tubers themselves. Formalin and various organic mercurial compounds have proved effective in recent tests. The latter have a greater lasting power than formalin, but, because of their poisonous nature, they should be used with discretion, and naturally only seed tubers should be treated.

The method of treatment is simply to dress out the seed tubers as they are harvested, place them in boxes to dip in a solution of the fungicide. The tubers should be as free from soil as possible, and they should be dried thoroughly before being put into close storage or into bags for transport. It is claimed that blight losses are reduced, and that corky scab, common scab, and black scurf are less evident in the subsequent crop by this treatment. A 5 per cent solution of formalin makes a good disinfectant for spraying contaminated storehouses.

The earlier varieties are most frequently affected with storage diseases, but occasionally some of the later-maturing types suffer appreciably. The more susceptible varieties are Arran Pilot, Catriona, Di Vernon, Duke of York, May Queen, Ninetyfold, and Sharpe's Express; while others which sometimes give trouble include Dargill Early, British Queen, Arran Comrade, Majestic, Doon Star, King Edward, and Dunbar Standard. No variety, however, is immune from the dry-rots. All are liable to suffer, and the proportion of losses is always greater when tubers have been roughly handled, because the wounds inflicted facilitate the entry of the disease organisms.

SPROUTING OF SEED TUBERS.

Increased productivity has invariably followed the wider application of methods of disease control. The value of good disease-free seed, however, can be enhanced by suitable pre-treatment to give strong hardy sprouts. The advantages of planting sprouted seed have long been realised by growers of early varieties for ware purposes. It is not sufficiently known, however, that late varieties benefit to fully the same extent. Sprouted seed has been proved,

in a number of trials, to give plants with stronger and more weather-resistant haulms which mature earlier and produce a heavier crop of better quality ware than unsprouted seed of the same stock. These are all particularly valuable attributes. Size and quality of crop are the substance of successful ware production, and the earlier maturity induced in late varieties may mean the difference between success and failure at potato harvest in the late districts. Other advantages to be derived from sprouting are that blind, diseased, or rogue seed tubers can be seen and removed before planting, whilst planting can be delayed until soil conditions are suitable. Sprouted tubers begin to grow almost immediately they are covered.

Growers who have reaped the benefits of sprouting, and they are increasing in numbers, have found that the provision of buildings and boxes quickly repays itself both in increased returns and in the spread-over of the labour involved in planting preparations. In connection with the practice it should be mentioned that the occasional fumigation of potato stores containing sprouted tubers is a wise precautionary measure to adopt, particularly if green-fly are seen. These pests carry virus diseases from sprout to sprout as readily as from plant to plant, and their persistence on the sprouts after planting gives rise to initial infestation in the field. Infection incurred through sprouts shows up when the plants attain full growth. For fumigation good results have been obtained by using any of the commercial nicotine preparations or by sprinkling tetrachlorethane on the floor of the store. During the operation all doors and ventilators should remain closed for twenty-four hours.

CUTTING OF SEED TUBERS.

Frequently in the past it has been observed that a first-class stock has been jeopardised by the use of poor unhealthy seed to complete the planting of a field or simply to fill in the endrigs. Such a practice is false economy. It is much wiser to utilise the extra ground for turnips, or to cut the larger tubers of the good stock to provide the necessary seed.

Experience has shown that if sufficient attention is paid to the handling of the setts, most varieties can be cut successfully. The chief point to observe is that cut surfaces should not be exposed to drying conditions. Rapid drying, particularly by exposure to direct sunlight, prevents the formation of a layer of cork over the wound, and so allows disease organisms to enter and set up tuber decay. Blanks in fields planted with cut setts are generally due to the absence of proper healing and the consequent rotting of the tuber.

In order to induce perfect healing, cutting should be done in cool sheltered buildings and the tubers spread out in shallow boxes or in small heaps. Rapid drying can be avoided by covering the boxes or heaps lightly with damp sacks. In no case is it advisable to use lime, ashes, or any other dusting treatment on the

cut surface, nor should cut tubers be stored in bags. With varieties which do not cut well, most first earlies, Majestic, Doon Star, and Arran Consul, for example, it has been found that sprouted seed, cut and planted immediately with the cut surface downwards, gives the best results.

POTATO VARIETIES.

The essential requirements in producing and maintaining healthy seed stocks of potatoes may be summarised as a favourable environment, the use of sound basic material, and constant supervision of the growing crop. To these may be added a thorough knowledge of the merits and defects of the varieties grown. The choice of varieties is extensive, and selection of the most suitable is affected by a multitude of circumstances of which local conditions are the most important. In the best districts almost any variety in popular demand may be grown successfully, if sufficient attention is paid to the cardinal virtues of purity and health of the original stock combined with early and constant roguing during the growing period. In the less favourable situations, varieties which are particularly susceptible to deterioration through virus diseases should be avoided.

For ware production, soil conditions and local market demands are all-important considerations. Thus choice of variety is more restricted and is dependent upon maturity, particularly in early or very late districts, and such variable factors as quality and cropping power in relation to soil conditions, together with liability to second growth, sprain, internal rust spot, and soil-borne diseases. For ware purposes in Scotland, Epicure, though nearly fifty years old and non-immune from wart disease, retains pride of place as a first-early variety. This position is maintained by reason of its hardiness and powers of recovery after frost damage, its early bulking capacity and its freedom from mosaic diseases and dry-rot. Arran Pilot, a relatively new and wart-immune variety, is now grown to a fairly large extent. It is a true first-early and gives a good crop of excellent shaped tubers, but it is very susceptible to virus diseases and deteriorates rapidly. Duke of York, again an old and wart-susceptible variety, is the most popular of all earlies for garden purposes. The acreage of this variety was never large, but its earliness and excellent table quality have helped to maintain a demand in spite of its rather low-yielding capacity. Ninetyfold, Sharpe's Express, and May Queen are grown in Scotland mainly for the seed trade with England. All are non-immune from wart disease and all are subject to dry-rot in storage. Two new and attractive first-early varieties, Ulster Chieftain and Vanguard, have recently been introduced, but although preliminary reports are good, there is yet insufficient evidence upon which to form a judgment as to their commercial future.

The acreage of second-early varieties has shown a gradual but marked tendency to decline during the past twenty years. British

Queen in Scotland and Eclipse in England, both non-immune from wart disease, are the only second-earlies grown to any extent. Eclipse, indeed, may be considered a first-early, for it is often grown as such in Eastern England, where it is most popular. Great Scot, which is immune and rather later in maturity, covers a large acreage in Scotland, but as it is grown as an early maincrop to avoid the repercussions of a glut of earlies on the market, it cannot be considered as a true second-early. Dunbar Rover, an immune variety of excellent shape, good cropping power, and good eating quality, is the only innovation of importance in this group.

Maincrop varieties occupy by far the greatest proportion of the potato acreage, and in Scotland, Kerr's Pink is easily the most popular. The acreage given over to this variety is diminishing slightly in relation to the total, but it is still considerably greater than that of any other variety. It is an excellent cropper and cooks and keeps well, but it is rather late in maturing, is prone to second growth in wet seasons, and is subject to wilding variations. Red-skin, which in appearance of tuber is similar to Kerr's Pink but is earlier in maturity; Doon Star, a white-skinned variety which provides a heavy crop of large tubers of good 'chipping' quality and is very suitable for lighter types of land; and Dunbar Standard, a white-skinned oval variety of good quality but rather late maturity, are all encroaching a little on the Kerr's Pink acreage. Golden Wonder has an established reputation for its good keeping and cooking qualities. It is a light cropper of very late maturity, and should not be grown on late ground. Arran Consul, a good cropper and keeper, has proved to be very susceptible to leaf roll, and it is unsuitable for seed production except in the most favourable areas. Arran Chief was, twenty years ago, the most popular maincrop variety in Scotland. As it is non-immune from wart disease, and deteriorates rather badly with mosaic diseases, however, it has been almost completely replaced by Kerr's Pink.

For the seed trade with England, Majestic and King Edward are the leading varieties. Majestic is a heavy cropping variety, but it is subject to all forms of mosaic disease, and hence is difficult to keep at high standards of health. King Edward is the only non-immune maincrop to have retained its popularity to the present time. It is not an outstandingly good yielder, nor does it respond to heavy manuring. The general health of this variety is, however, at a higher level than that of any other variety, a quality that can now be ascribed entirely to its field immunity from viruses X and A. King Edward owes much of its popularity to its good shape and quality, and to the fact that it can be easily identified by its distinctive pink-and-white tubers. It has been said that in the face of King Edward lies its fortune. This may be true, but its length of life, over forty years, is a matter of its continued good health. A rival to King Edward, in shape and colour of tuber at least, has recently made headway. This variety, Gladstone, is immune from wart disease, but is rather susceptible to leaf roll, and hence requires care in seed stocks.

Another maincrop variety which has increased in popularity within recent years is Arran Banner, an outstanding cropper, but of only fair quality. On good land this variety tends to grow coarse, and it should therefore be planted closer than is the usual practice for maincrop varieties. A new early maincrop possessing the rare and valuable characters of field immunity from viruses X and A has recently been introduced under the name of Craigs Defiance. This variety, which produces a good yield of white, oval-kidney tubers of excellent quality, should readily be maintained at a high standard of health in Scotland.

All these varieties possess individual qualities which have commended themselves to practical growers, yet all have faults which afford ample scope for improvement. Particularly is this true with regard to their susceptibility to virus diseases and blight. Recent studies have revealed that inherent, hereditary resistance to some of the common viruses is to be found within the range of cultivated varieties as well as in more primitive forms of the potato. Resistance to blight has also been found, but only in a few wild species of Mexican origin. The aggregation of these various qualities of resistance and their incorporation in commercial types offers wide possibilities for future potato breeding. Already considerable progress towards this end has been made, and seedlings combining resistance to blight with field immunity from viruses X and A, and showing promise of fulfilling the general requirements of agricultural practice, are now undergoing their preliminary tests.

THE RELATION OF FARM SELF-SUFFICIENCY TO THE ATTAINMENT OF MILK TARGETS.

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IN 1938 an article was published in the 'Transactions' [1] stressing the importance of achieving a greater measure of self-sufficiency in the country's supplies of animal feeding-stuffs. The outbreak of war, and the consequent deterioration in the shipping position, gave dramatic emphasis to the views then put forward. The subject has received well-merited attention in succeeding volumes of the 'Transactions,' to which articles on various aspects of self-sufficiency have been contributed by Professor J. A. Scott Watson [2], Principal W. G. R. Paterson [3], and Mr A. S. B. Wilson [4].

It might seem that any further discussion of the subject would therefore meantime be redundant, since so much of the ground has now been covered. Nevertheless, there are at least three reasons which justify a further article. In the first place, the passage of time has increased rather than diminished the need for expanding our home production of animal feeding-stuffs. Already the share of rations allotted to pigs and poultry has become so small as to provide for only a bare skeleton of the pre-war stock. Rations for beef cattle and sheep have also been reduced to a bare minimum, and the actual and impending diversion of cereals and cereal products—wheatfeed, barley, and oats [5]—to the national loaf will inevitably curtail still further the available supplies, as will the increasing stringency of the shipping situation. In the second place, the articles referred to above have dealt only with certain individual sources of feeding-stuffs. No attempt has been made to show how such home-produced supplies can be dovetailed with one another to constitute a balanced policy of farm self-sufficiency. Yet it is clear that unless such a balanced policy can be devised, any increase in the volume of home-produced feeding-stuffs will not be utilised to the best advantage. In the third place, the trend in agricultural production has recently been modified in order to accord first priority to milk, even at the expense of foods such as wheat and potatoes which are suitable for direct human consumption. In dairy areas it is therefore necessary to devote increasing attention to the growing of crops capable of maintaining milk production at a reasonably high level. The vital importance of maintaining the country's milk supply is emphasised by the official adoption of a system of milk 'targets,' allotted on either a regional or an individual basis. But if farmers are to be set definite targets in relation to their output of milk, much of which will obviously

have to be produced from home-grown feeds, it is clear that some guidance should be available regarding the best allocation of their available acreage as between one crop and another and between arable crops and grass.

For the past few years the policy adopted on the Hannah Institute's farm of Kirkhill has been to rely to an increasing extent on home-grown feeding-stuffs for the maintenance of the dairy herd. By 1939 the proportion of purchased feeds had been reduced to less than 20 per cent, as compared with 40-50 per cent in earlier years. On the outbreak of war it was decided to attempt to achieve complete self-sufficiency,—i.e., to cut out entirely all purchases of feeding-stuffs. By 1940-41 this aim had been achieved, and the Institute was able to make the somewhat striking gesture of surrendering unused all the feeding-stuffs coupons to which the farm was entitled. While it is not claimed that such complete self-sufficiency should be the aim of every milk-producing farm (indeed, it will be made clear at the end of this article that farmers should normally take full advantage of any feeding-stuffs supplies to which they are entitled), the principles adopted and the results achieved at Kirkhill are of such potential importance that a full discussion of them appears warranted.

RELATION OF CROPPING POLICY TO MILK TARGET.

Kirkhill Farm covers about 140 acres, 134 acres being cultivated land. The farm is situated on the Ayrshire coast, the type of soil is a medium loam, the climate is mild, and the rainfall moderate and well spaced throughout the year. Before the Institute took over the farm it was largely covered with old worn-out permanent pasture which was used for grazing miscellaneous stock. From 1930 onwards this grassland was gradually converted into a more highly productive state, either by taking it into rotation or by ploughing and direct re-seeding. Adequate fertiliser dressings were also applied. A dairy herd of milk-recorded pedigree Ayrshire cattle was simultaneously built up, the basis of breeding policy being the production of reasonably high milk yields consistent with the maintenance of sound constitution. The management of the herd was carried out on progressive lines, and all stock received rations based strictly on their calculated requirements.

In the two years 1938-40 the average annual milk production of the herd was slightly over 18,000 gallons. It was felt that a total production of 20,000 gallons, half to be produced in the five summer months (May to September) and half in the seven winter months (October to April) would be a fair target for 1940-41, the first year in which complete self-sufficiency was envisaged.

In planning a cropping policy which would ensure the requisite supplies of home-produced feeding-stuffs to produce this target, three main factors were taken into account: *first*, the need for producing crops which would be capable of conservation for winter use; *second*, the importance of choosing those which would produce

the largest supplies of nutrients suitable for milk production; and *third*, the necessity for relating the cropping policy to local conditions of climate and soil as well as to the cropping system already practised. It will be necessary to deal with each of these factors in some detail.

Table I. shows the pre-war allocation of cultivated land between grass and crops in three representative areas—*i.e.*, in Scotland, in

TABLE I.—COMPARATIVE ACREAGES UNDER GRASS AND CROPS.

	Scotland, 1938. ¹	Six dairying counties, 1938. ¹	Ayrshire, 1938. ¹	Kirkhill, 1940.
	Per cent.	Per cent.	Per cent.	Per cent.
<i>Grass—</i>				
Grazing ²	57	66	68	28
Grass silage and dried grass .	..	..	..	12
Hay	13	15	16	24
Total grassland	70	81	84	64
<i>Crops—</i>				
Oats	18½	12½	11	17½
Beans	< 0.1	< 0.1	< 0.1	4½ ³
Green forage crops	½	½	½	5 ⁴
Roots	7½	4	2	1
Potatoes	3½	2	2½	8
Total arable	30	19	16	36

¹ Figures taken from Agricultural Statistics, Scotland, 1938.

² Excludes rough grazing.

³ Includes small acreage of feeding linseed.

⁴ This figure does not include a catch crop of green barley sown after lifting potatoes.

the six most important dairying counties,¹ and in Ayrshire—as compared with the allocation at Kirkhill in 1940. It will be seen that grazing, which is almost entirely a source of *summer* nutrients, accounted for between 57 and 68 per cent of the total cultivated acreage of the three representative areas (being highest in the typical dairying district of Ayrshire), whereas only 28 per cent of the Kirkhill acreage was allotted to grazing. On the other hand, Kirkhill devoted a relatively high proportion (24 per cent) of the available acreage to hay, while a considerable area (12 per cent) was allotted to the production of grass silage and dried grass. Taken as a whole, the herbage from over half the grass acreage at Kirkhill was available for conversion into winter feeding-stuffs, compared with less than one-fifth for the three representative areas.

¹ *I.e.*, Ayr, Lanark, Wigtown, Dumfries, Kirkcudbright, and Renfrew, which together supply over three-quarters of the milk sold in the area of the Scottish Milk Marketing Board.

Moreover, the allocation of the arable acreage at Kirkhill also favoured the production of crops suitable for the winter feeding of the dairy herd, exceptionally high acreages being allotted to beans and oats, as well as to green forage crops such as kale. This was made possible by severely limiting the grassland acreage—i.e., by a drastic application of the plough policy. Thus the cropping programme adopted at Kirkhill fulfilled the first essential of allotting a sufficient acreage for winter as well as for summer feeding.

The second essential was to select crops capable of giving maximum quantities of the types of feed needed by dairy stock. It is important to note that for this purpose it is necessary to take into consideration not only the needs of the milking stock *but the needs of the herd as a whole*. It is usual in calculating rations for milking stock to separate the requirements for maintenance and for milk production. Thus if the maintenance requirement is met from coarse fodders, the milk production requirement can be calculated on the assumption that each $\frac{1}{2}$ lb. of protein equivalent¹ in the feed will be sufficient to produce one gallon of milk. For allocating rations to individual animals this method of calculation is ideal, *but as a basis of assessing the overall needs of a herd in relation to a milk target it is of little value*, since these overall needs include (a) the requirements for the maintenance and growth of the young stock, (b) the requirements for the maintenance of in-calf heifers, dry in-calf cows, and bulls, in addition to (c) the requirements for the maintenance and milk production of the milking stock. An alternative basis of calculation has therefore had to be devised. The basis of this method is the finding, recorded by Leitch and Godden [6], that the overall efficiency of milk production (taking into account the complete life-cycle of an animal) is only about 20 per cent. Using this figure, with certain necessary adjustments,² it appears that for every gallon of milk produced the total protein equivalent necessary to be fed to the herd is 2 lb.

This new basis of calculation has been found in practice to be clear, simple, and (as will be shown later) accurate when applied under farm conditions. Table II. provides the necessary data for a typical series of crops. The first column shows the average yield of produce likely to be obtained per acre, and the second gives the pounds of protein equivalent contained in this yield.³ The third column gives what may perhaps best be termed the 'effective

¹ All calculations in this paper are based on protein equivalents, since protein becomes the limiting factor as a herd approaches self-sufficiency.

² Leitch and Godden give a figure of 18.1 per cent for the whole life and of 20.0 and 23.6 per cent for a single year for autumn and spring calvers respectively. For the present purpose a round figure of 20 per cent has been used. Leitch and Godden also show that, in converting the feed protein to animal protein, only six-sevenths is obtained as milk protein, the remaining one-seventh being the flesh protein of the cow's own body and of her calves. The average protein content of milk may be taken as 3.4 per cent. The weight of milk produced from 1 lb. of protein equivalent in the feed may therefore be calculated as $(1 \times 20/100 \times 6/7 \times 100/3.4)$, or 5 lb. of milk. Thus 2 lb. of protein equivalent will be capable of producing 10 lb. (or 1 gallon) of milk.

³ The crop yields are based on the average figures for 1923-36, as recorded in Agricultural Statistics (Scotland), 1938. The composition of the crops is taken from "The Composition and Nutritive Value of Feeding-stuffs," published as Bulletin No. 124 of the Ministry of Agriculture and Fisheries.

milk equivalent'—i.e., the quantity of milk obtainable from 1 acre when the overall needs of the herd as a whole are taken into account. *This is the figure which should be used in assessing the acreages required to reach a given milk target.* It will be noted that the effective milk equivalent is exactly half the protein equivalent figure. This fact renders the overall milk-producing capacity of a given area (or a given weight of crop) to be very simply calculated. *It is only necessary to halve the protein equivalent (which can be readily ascertained by reference to tables of composition of feeding-stuffs) present in the crop; the resulting figure represents the total gallonage of milk which should be obtainable when the crop is fed to the herd.*

TABLE II.—COMPARATIVE VALUES FOR MILK PRODUCTION OF VARIOUS CROPS.

Crop.	Yield per acre.	Protein equivalent per acre (lb.).	Effective milk equivalent per acre (gallons).	Ratio P.E./S.E.
Grazing or grass silage ¹	10 tons	500	250	1 : 5
Kale	15 tons	440	220	1 : 7
Soiling crop	12 tons	370	185	1 : 8½
Beans, grain ²	16 cwt.	360	180	1 : 3½
Linseed	16 cwt.	340	170	1 : 6½
Swedes	16 tons	250	125	1 : 10
Hay	30 cwt.	160	80	1 : 7
Oats, grain ²	16 cwt.	140	70	1 : 8
Straw, bean	25 cwt.	50	25	1 : 12
Straw, oat	25 cwt.	25	12	1 : 20

¹ The figures for grazing and grass silage given in this table are based on the assumption that the grassland is of first-rate productive capacity, and is well managed. Higher figures would be obtained with heavily manured and intensively grazed pastures: lower figures with poorly managed swards.

² For total production per acre, add straw.

Reference to the two left-hand columns of Table III. will show how this method of calculation can be used in relating the Kirkhill milk target to the cropping policy. For instance, 37½ acres were allotted to summer grazing. With an effective milk equivalent of 250 gallons per acre (Table II.), this acreage should be sufficient to provide 37½ × 250, or 9320 gallons in the season. An additional 4 acres of soiling crop should provide, with an effective milk equivalent per acre of 185 gallons, a further 740 gallons. Thus the acreage allocated for the summer period should be adequate to meet the summer target of roughly 10,000 gallons. Similar calculations for the acreages allocated to winter feeds show that these in turn should be sufficient to cover the winter target of 10,000 gallons.

The fourth column in Table II. shows the ratio of protein

equivalent to starch equivalent for each of the crops. This figure is of practical importance in providing an indication of the value of the individual crops for growth and milk production on the one hand and maintenance and fattening on the other. For growth and milk production the ratio should not be markedly wider than 1 : 5 ; for maintenance or fattening a ratio of 1 : 10 is a reasonable figure. It is clear that, in allocating the acreage for a milk-producing

TABLE III.—PLANNED CROPPING FOR MILK PRODUCTION: ALLOCATION OF ACREAGE AND ACTUAL CROP YIELDS AT KIRKHILL.

	Estimated output.		Actual output.	
	Acreage allocated.	Effective milk equivalent (gallons).	Crop yield obtained (tons).	Effective milk equivalent (gallons).
<i>Summer Period—</i>				
Grazing . . .	37½	9,320	..	9,320
Soiling crop . .	4	740	31½	642
Summer total .		10,060		9,962
<i>Winter Period—</i>				
Grass silage . .	16½	4,050	126	2,806
Dried grass . .			23	1,633
Hay	32½	2,580	67½	3,475
Oats	23½	1,920	30½	2,925
Beans	4½	975	5½	1,245
Kale	3	660	34½	507
Dried barley catch crop . . . . .	..	..	2	494
Dried soiling crop .	..	..	2½	316
Linseed	1	170	¾	155
Swedes	1	125	7	55
				13,611
			Less effective milk equivalent of crops sold (i.e., oats 9½, beans ½, dried grass 23, and dried soiling crop 2½ tons)	2,901
Winter total .		10,480	Winter total .	10,710
Total for year .		20,540		20,672

Actual milk production achieved—

Summer period	9,000 gallons
Winter period	9,585
Total for year	18,585

farm, the tendency should be to favour crops with a fairly narrow ratio. It will be seen from Table I. that this policy was adopted at Kirkhill, where an exceptionally high proportion of the acreage was allotted to beans, green forage crops, hay, and grass silage.

The third essential which had to be taken into account in allocating the acreage at Kirkhill was to relate the cropping policy to climatic and soil conditions and to the cropping system already practised. It will be sufficient to note here that experience in earlier years had ensured that all the crops (except linseed) could be relied on to give reasonably high yields, while the improvements which had been effected during the previous ten years in the productivity of the grassland justified liberal estimates of the probable yields of grazing herbage, hay, and silage.

PRODUCTION ACTUALLY ACHIEVED.

The production actually achieved at Kirkhill can be considered under four heads: (i) crop yields, (ii) milk production and sale of crops, (iii) the relation between the seasonal production and utilisation of the crops, and (iv) the level of the stock-carrying and milk-producing capacity.

Crop Yields.

The crop yields were in general somewhat higher than the average figures for Scotland on which the values in Table II. are based. The following comments may be made on the individual crops:—

Grass.—It is extremely difficult to estimate the yields of herbage produced on grazing land. Moreover, while definite acreages of grass were nominally allotted for hay and silage production in Table I., the system of grassland management adopted at Kirkhill is elastic, a practice which is essential in dealing with a crop so susceptible to changing weather conditions. Thus it is customary to confine the grazing to a smaller acreage during the spring flush, conserving any surplus herbage by ensiling or artificial drying, and to expand the grazing area as the growth of grass becomes more scanty. The aftermath from hay is also used for grazing, as is (where practicable) the aftermath from ensiling and artificial drying, though the fields allotted for the latter purposes are normally kept free from cattle for the greater part of the season, during which they are cut two, three, or four times.

Though it has not been feasible to record the output of grass and grass products in terms of actual yield per acre, it may be noted, first, that milk production was well maintained throughout the summer season on the somewhat limited grazing acreage; and second, that the yield of herbage for ensiling was sufficient to provide 126 tons of silage, and in addition to furnish 23 tons of artificially dried grass.¹

¹ The dried grass and other artificially dried crops were produced on a "P. and M." drier which had been installed at Kirkhill in 1936.

Hay.—The 32½ acres allotted to the hay crop produced 67½ tons of hay, giving a yield per acre of 42 cwt. compared with the Scottish average of 44 cwt. for rotation hay and 31 cwt. for permanent hay. The estimated yield shown in Table II. is based on the latter figure.

Oats.—The oat crop produced 30½ tons of grain from 23½ acres, plus an equivalent weight of straw. This represents a yield per acre of 26 cwt.,¹ compared with the Scottish average of 16 cwt.

Beans.—The outstanding value of beans as a milk-producing feed, on account of both the quantity and the quality of its protein, is well recognised. The 4½ acres allotted to the bean crop produced 5½ tons of beans, plus an equivalent weight of straw. This corresponds to a yield per acre of 22 cwt.,¹ compared with the British average of 16 cwt. This high yield indicates that, contrary to currently expressed views, the climate and soil of the south-west of Scotland is not unfavourable to the growing of beans, though adverse weather conditions are stated to affect the bean crop more than any other factor [7].

Kale.—Marrow-stem kale was grown as a green crop of relatively high protein content, capable of filling the gap in feeding-stuffs between November and January. However, the 3 acres only produced 34½ tons, a disappointingly low yield of 11½ tons per acre compared with an anticipated yield of at least 15 tons.

Soiling Crop and Catch-crop.—The soiling crop consisted of a mixture of barley, vetches, peas, and Italian ryegrass sown in the ratio of 84 : 32 : 32 : 44 lb. per acre. As an experiment part of the crop was cut and fed green during the early summer; the remainder was artificially dried for winter use. The 4 acres allotted produced the equivalent of 6½ tons of dried material with an average crude protein content of 18½ per cent. In addition a catch-crop of barley was taken off 11 acres of potato land, being sown (at the rate of 1½ cwt. per acre) in August and cut green for artificial drying in November. The crop produced 2 tons of dried material with the exceptionally high crude protein content of 27 per cent.

Linseed.—An acre of linseed was grown as an experiment to determine the feasibility of cultivating this crop under Scottish conditions. The Plate linseed used was a special variety suitable for the production of seed. The yield of oil-seeds was 15 cwt. Owing to their high oil content the seeds were, however, unsuitable for milk production, but they were used for conditioning young stock and produced an excellent 'bloom.'

Swedes.—Roots are primarily a source of energy rather than of protein, and as the farm was well supplied with straw and hay for maintenance purposes, swedes were only grown to fill up head-rigs and odd corners. The yield was consequently low—i.e., 7 tons per acre, compared with the Scottish average of 16 tons.

Potatoes.—Although potatoes were grown entirely for sale as human food, it may be noted that the 11 acres allotted to this

¹ Part of the oat and bean crops were grown on land which had only recently been leased to the Institute and which was in 'bad heart.' This materially lowered the average crop yields, which would otherwise have reached the high figure of 30-40 cwt. per acre.

crop produced an output of about 80 tons—a small but nevertheless useful addition to the national larder, considering the limited acreage of the holding.

Milk Production and Sale of Crops.

Knowing the actual crop yields obtained, it is possible to arrive at a more accurate estimate of the amounts of milk which each crop should have been capable of furnishing. The relevant figures are shown in the two right-hand columns of Table III. Taking first the summer period, the effective milk equivalent of the grazing area (9320 gallons) naturally remained unaltered, no method being available for measuring the actual yield of nutrients. The figure for the soiling crop (642 gallons) was smaller than that estimated, but this was due not to a lowered yield, but to the fact that the whole of the crop could not be made use of in a fresh state, and roughly half was therefore artificially dried for winter use. The effective milk equivalent for the summer period therefore worked out at 9962 gallons, compared with the 9000 gallons actually obtained, a reasonably close agreement.

Turning to the winter period, it will be seen that grass silage plus dried grass headed the list, with an effective milk equivalent of 4439 gallons, against an estimate of 4050. The figures for hay (3475 gallons), oats (2925 gallons), and beans (1245 gallons) were also markedly higher than the estimate, a fact due to the excellent yields obtained with these three crops. Kale, linseed, and turnips showed, on the other hand, slightly lower figures than had been anticipated. Taking all crops into account, the total effective milk equivalent of the feeds available for winter feeding worked out at 13,611 gallons. This very markedly exceeded the milk target of 10,000 gallons originally aimed at, and it was therefore possible to sell part of the crops for use in neighbouring herds. The quantities sold would have been sufficient to have produced just under 3000 gallons of milk. When allowance is made for these sales, the feeding-stuffs retained on the farm should have been capable of producing 10,710 gallons. The actual winter milk output achieved was 9585 gallons, a figure which agains shows very fair agreement with the original target. The slight discrepancy between the calculated production and the actual output achieved in both the summer and winter periods is probably attributable to the fact that the calculated figure makes no allowance for the food required by horses or by bulls. *Nevertheless the total milk output of 18,585 gallons is so close to the planned target of 20,000 gallons (especially when the 3000 gallons milk equivalent of the crops sold are taken into account), and the division of output between summer and winter is so even, that it may justly be claimed that the Kirkhill results fully substantiate the technique of acreage allocation which has been described in the earlier part of this paper.* It would appear, indeed, that the practice of calculating effective milk equivalents should provide a new and accurate means of assessing the milk-producing capacity of a dairy holding in relation to any allotted milk target, and should therefore be of definite practical value both

to dairy farmers and to authorities responsible for allocating milk targets.

One further point should be mentioned. If reference is made to the right-hand column of Table III. it will be seen that grass not only provided the great bulk of the summer nutrients, but that it furnished the raw material (in the form of silage, hay, and dried grass) for the production of some 60 per cent of the winter milk output. This fact re-emphasises the great potential importance of grass and grass products in the nutritional economy of the dairy herd under war conditions, and confirms the importance of developing to the full all available methods of grass conservation.

The Relation between the Seasonal Production and Utilisation of the Crops.

Reference has already been made to the overriding importance of allotting a sufficient acreage to crops capable of conversion into winter feeding-stuffs. The extent to which this was achieved at Kirkhill has already been indicated in Table III. A more complete picture is, however, provided in Figs. 1 and 2.

Fig. 1 illustrates the seasonal production of the various crops. For accurate comparison the yields have been expressed in terms of protein equivalent.¹ The outstanding feature is the high peak production during the five summer months compared with the almost negligible production during the seven winter months. It will be noted that in regard to the utilisation of grass herbage, first priority was given to silage: artificial drying was only employed as a means of conserving surplus herbage later in the season. Potatoes have been omitted from the diagram, as they were not used for stock-feeding; turnips have also been omitted, as the quantities available were too small to be graphed. Beans are included in the category of grain.

The lower section of Fig. 2 shows how this essentially summer production has been distributed to give a relatively even utilisation throughout the year. The silage, hay, and grain were used to fill the winter gaps and thus to ensure a relatively level output of milk,² as shown in the middle section of Fig. 2. There is, of course, an inevitable spring flush of milk in May and June, roughly paralleled by the increased supply of nutrients utilised. The somewhat unexpectedly high utilisation of nutrients from December to March was partly due to the increase in the percentage of cows calving at this season (see upper section of Fig 2), and partly to the fact that the nutrients derived from grazing were probably underestimated. *Taken as a whole, however, a comparison of Figs. 1 and 2 illustrates in striking fashion the main essential in the achievement*

¹ The figures for the nutrients available from grazing were arrived at by a difference method, as used by Dr R. E. Slade in a similar study [8]. These figures probably underestimate the actual yields of nutrients, but it is assumed that any surplus food eaten is returned to the land in the form of dung and urine.

² The utilisation figures do not correspond exactly to the production figures, because (i) part of the home-produced crops were sold, and (ii) the silage, hay, and grain fed in April to September were necessarily those carried over from the previous year (1933-40). The latter supplies are, however, self-balancing, since the surplus from 1940-41 was similarly carried over to 1941-42.

of self-sufficiency—namely, the conservation of summer crops to provide adequate winter nutrients.

The Level of Stock-carrying and Milk-producing Capacity Achieved.

The attainment of complete self-sufficiency in the supplies of feeding-stuffs would clearly be of very limited value if it were to reduce the stock-carrying and milk-producing capacity of a holding. But this statement needs qualification. Where extensive purchases

PRODUCTION OF ALL CROPS.

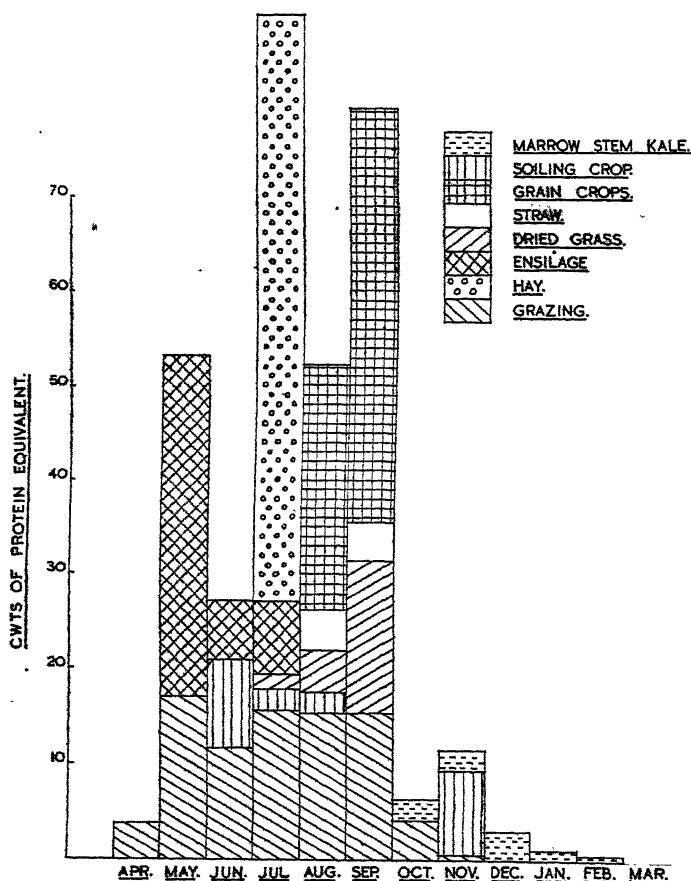
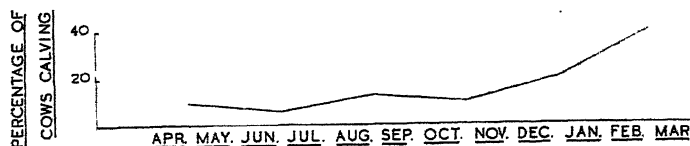


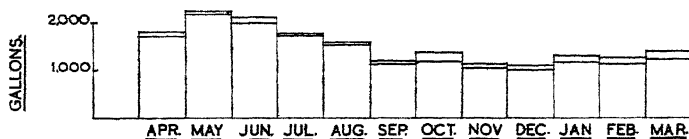
Fig. 1.—Diagram showing the seasonal production of crops at Kirkhill Farm. Note that the grazing nutrients consumed by sheep during the winter period and the output of potatoes have both been omitted from the diagram.

of feeding-stuffs are made, the stock-carrying capacity is not in fact related to the productivity of the land at all: it is mainly dependent on the extent of the byre accommodation. Thus, to take an extreme instance, only a fraction of an acre may be needed

DISTRIBUTION OF CALVING.



TOTAL MILK PRODUCTION.



UTILISATION OF FEEDING STUFFS.

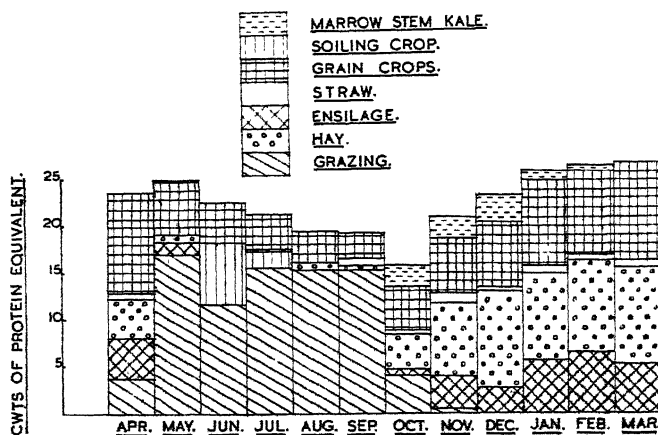


Fig. 2.—Diagram showing the even utilisation of the crops at Kirkhill Farm throughout the year, and the relation of this to the monthly milk production and distribution of calving. The narrow bands at the top of the milk production curve indicate the proportions of milk used for stock-feeding.

to accommodate the milking stock of a large 'town dairy'; yet no one would claim that this reflected a high stock-carrying capacity. Valid comparisons of stock-carrying capacity can therefore only be made where the land itself supplies the greater part of the nutrients—i.e., where the proportion of purchased feeds is strictly limited. It will nevertheless be instructive to see how the stock-carrying and milk-producing capacity of Kirkhill, working under a policy of complete self-sufficiency, compares with that of the generality of Scottish dairy farms.

Relevant comparisons are shown in Table IV. In constructing this table all acreages of rough grazing have been omitted, the figures being based on the total cultivated acreage—i.e., the area under crops and grass. All figures are calculated from the 4th June

TABLE IV.—COMPARATIVE STOCK-CARRYING AND MILK-PRODUCING CAPACITIES.

	Scotland, 1938.	Six dairying counties, 1938.	Eighty selected dairy farms, 1937-38.	Ayrshire, 1938.	Kirkhill, 1940.
Head of cattle per 100 acres	29	38	38	42	44
Head of milking cows ¹ per 100 acres	9	15	17	17	22
Milk produced for sale per acre per year (gallons)	39	77	90	103	130
Milk produced for sale per milking cow ¹ per year (gallons)	423	511	516	592	601

The number of milking cows is taken as the total number of cows in milk, plus cows in calf at 4th June.

returns as published in official Agricultural Statistics. In order to meet the argument that these statistics cover holdings other than dairy farms, the results obtained on eighty selected dairy farms included in the Department of Agriculture's Tenth Economic Report for 1937-38 have also been inserted in the table [9].

The figures speak for themselves. The stock-carrying and milk-producing capacity of Kirkhill not only materially exceeded the Scottish average, but was greater than the averages for either the six dairying counties, the eighty selected dairy farms, or Ayrshire itself, the county in which Kirkhill is situated. Moreover, the average milk produced for sale per milking cow was also highest for Kirkhill. *This result is the more striking when it is realised that the Kirkhill figures were obtained under a self-sufficiency policy, whereas the remaining figures apply to herds in which there were unfettered purchases of pre-war feeding-stuffs.*

If it had been decided to use purchased feeding-stuffs at Kirk-

hill the stock-carrying and milk-producing capacity would, of course, have been correspondingly increased. This may be seen from the results obtained on the farm in 1936-37, when purchases of roughly 100 tons of feeding-stuffs were made, in addition to general improvements in the grassland and crop management. The stock-carrying capacity was raised to eighty-two head of cattle (including forty-seven milking cows) per 100 acres, and the total milk sales to 250 gallons per acre.

It may be mentioned that the milk for sale was simultaneously raised from 601 to 645 gallons per milking cow. This is an overall figure, based on the total number of cows in milk, plus cows in calf. The level of the corresponding yields based on individual milk records was naturally higher, being roughly 700 gallons per lactation under self-sufficiency and between 800 and 900 gallons per lactation when purchased feeding-stuffs were superimposed on improved farm management. It is a very general finding that the feeding of the more bulky home-produced foods tends to result in somewhat lower lactation yields than feeding on concentrates, a drawback which appears to be inseparable from a policy of self-sufficiency.

Nevertheless, the main conclusions regarding stock-carrying and milk-producing capacity are clear. *Self-sufficiency has been shown to be capable of maintaining the productive capacity of Kirkhill well above the average of the ordinary dairy farm.* By superimposing purchases of feeding-stuffs this level can be raised still higher, though it should be realised that this will no longer reflect the *true* productive capacity of the holding itself. Under such circumstances milk production will tend to acquire the character of a 'processing' rather than of a producing industry. By adopting the general methods of cropping developed at Kirkhill, in addition to utilising any purchased feeds which may be allotted to him, the dairy farmer can, therefore, expect to increase materially the stock-carrying and milk-producing capacity of his holding. If at any time a turn in the fortunes of war should, however, reduce the allotment of feeding-stuffs, he would, as a result of the improvement in the productiveness of his holding, still be able to face with confidence an enforced policy of self-sufficiency.

One further point should be noted. It might be thought that the policy of self-sufficiency practised at Kirkhill had only been achieved at the cost of a reduced output of products other than milk. This would be a false conclusion. It has already been mentioned that, apart from the home-produced foods used on the farm, a fair proportion of the oats and beans and the whole of the dried grass and dried soiling crop (amounting in all to 36 tons of feeding-stuffs) were sold for use on other holdings. In addition, the farm produced and sold some 80 tons of potatoes, a level of production for a total holding of only 134 acres which is comparable to the average recorded for the intensive potato-producing counties of East Lothian and Fife. Further, the Kirkhill grassland supported during the six winter months over 6½ score of stock lambs from a hill farm.

CAN SELF-SUFFICIENCY BE MORE WIDELY APPLIED ?

The results obtained at Kirkhill have been achieved by concentration on three main points: first, the growing of increased acreages of arable crops, particularly of beans, soiling and catch-crops, and kale; second, the improvement in the management and fertiliser treatment of the grassland, accompanied by the timely replacement of old and worn-out pastures; and third, the use of modern methods of grass conservation, such as ensiling, in order to ensure that a sufficiency of high quality grass herbage is available for winter use. It has been objected that these methods are of only limited and local application, and that they could not be successfully adopted on the majority of dairy holdings, particularly in the south-west of Scotland.

A cogent reply to this objection is available in the cropping policy which was successfully practised in Scotland in the first half of the nineteenth century—*i.e.*, before the influx of cheap imported feeding-stuffs. In this connection Table V., in which the

TABLE V.—COMPARATIVE ACREAGES FOR SIX DAIRYING COUNTIES¹
IN 1853 AND 1938.

	1853.	1938.
Oats	251,000	144,500
Roots	76,000	43,300
Wheat	34,000	7,200
Beans	10,900	160
Rotation grasses	486,000	309,000
Permanent pasture	344,000	637,000
Total	1,201,900	1,141,160

¹ *I.e.*, Ayr, Lanark, Wigtown, Dumfries, Kirkcudbright, and Renfrew.

allocation of acreages in the six chief dairying counties for 1853¹ and 1938 are compared, provides some very suggestive figures. It will be seen that in 1853 oats and roots covered twice the 1938 acreage, wheat showed a fivefold difference, while for every acre of beans grown in 1938 practically 70 acres were grown in 1853. The figure for rotation grass does not show quite such a marked difference, but the 1853 acreage was nevertheless well over 50 per cent higher than that of 1938. If reference is made to the cropping policy adopted at Kirkhill, it will be clear that this has, in effect,

¹ 1853 was the first year in which complete Scottish statistics were recorded. It is interesting to note that the work was undertaken under the Highland and Agricultural Society's auspices, and that the figures were actually published in the 1853-55 volume of the 'Transactions.'

been largely founded on a return to the arable and grassland cultivation which was the hallmark of Scottish agricultural practice in the middle of the last century, supplemented by modern methods of grass conservation.

Is it too much to expect that the goal set by Scottish agriculturists in 1853 could, with all the improvements in agricultural technique which have since become available, be equally well achieved, if not exceeded, by their descendants nearly a hundred years later?

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FARM TAXATION AND FARMERS' ACCOUNTS.

SUPPLEMENTARY NOTES.¹

By E. A. BELL, M.A., B.Sc.(Agr.), Farm Accountant, Ayr.

It had been anticipated that the Finance Act of 1942 would reduce the rental limit under which farmers were exempted from compulsory assessment on actual profits and, in the event, the limit was reduced from £300 to £100. This change has brought a very considerable number of farmers under the necessity of paying tax on their actual profits as shown by accounts. In the 1941 Act a provision was included which allowed the adjustment of Income Tax for the first year of compulsory assessment on profits to the results of the actual year instead of the preceding year's profit, which would normally have been the basis. A corresponding provision (known as Section 28 Subsection 5) was incorporated in the 1942 Act, and farmers coming under assessment on profits for the first time in 1942-43 can have their tax based upon the profits of the actual year ending 5th April 1943. The strict interpretation of this provision involves, as previously, the allocation on a time basis of the profits of two accounting years if these do not happen to coincide with the tax year to 5th April, but in practice Inspectors of Taxes are prepared, concessionally, to accept the profit of any accounting year ended within the tax year to 5th April 1943 as showing the actual profit for the purposes of this section.

When introducing the Finance Act the Chancellor of the Exchequer undertook that the Inland Revenue Department would consult with representatives of the farming community as to the bases of valuation to be adopted for various classes of farm stock and crop, and agreed that valuations already made could be adjusted to the new principles adopted. Negotiations on this matter were protracted, and the results were published in the Press only in the latter end of 1942. They were accompanied by a promise that explanatory notes would be issued in booklet form thereafter, and this was issued in February 1943.

In the case of certain classes of stock an alternative basis of treatment for the purpose of taxation has been agreed to by the Inland Revenue, and it is extremely important that in making a choice between these alternatives full consideration should be given to the effect of the decision, both on the past and on the future. Any basis of valuation now adopted must be consistently applied. The farmer will be expected to adhere to the chosen basis for

¹ For previous article see volume of 'Transactions' for 1942, pp. 28-53.

future accounts, and the Inland Revenue may demand the adjustment of past assessments where it appears that the adoption of an incorrect basis has resulted in a material loss of tax. If, therefore, a farmer ends his accounts, say, at 31st December 1941 with a low valuation of stock on one basis and starts off his accounts for the next year on 1st January 1942 with a much higher valuation of the same stock on another basis, it is more than probable that the Inspector of Taxes concerned will demand Income Tax and/or Excess Profits Tax on the difference between the valuations. Alternatively, he may demand that the valuations be revised to a consistent basis right back to the beginning of the Excess Profits Tax period at 1st April 1939.

The main alternative which has been agreed to is for such stock as dairy herds, ewe flocks, &c., which are maintained as such for the purpose of producing a saleable article—*e.g.*, milk, wool, lambs, &c. (as distinct from animals which may be used for production for a short time and then sold, such as, for example, a flying flock of ewes), and the arrangement also covers working horses. These classes of stock may either be treated as 'stock-in-trade' or may be treated on a basis which, for convenience, is referred to as a 'capital' basis. If the former alternative is selected the stock will be regarded as saleable stock, and must be valued from year to year on the basis of "cost or market value, whichever is the lower," and if the stock be realised either as a whole or in part the profit or loss resulting from the sale of the stock at higher or lower prices than those at which they appear in the books will be treated as profit or loss for the purposes of taxation. If, on the other hand, the latter alternative is selected, the stock will, in effect, be maintained from year to year on a valuation of equal prices per head, the cost of maintaining stock either by home-bred replacements or by purchase being allowed as an expense against the profits of the year. On this basis, when the herd or flock is sold as a whole, or any substantial number is sold on a definite permanent reduction, the profit or loss resulting is treated as a capital profit or loss, and is ignored for the purpose of tax. The general effect of these alternatives is that treatment on the basis of stock-in-trade will result in greater payments of tax during a period of rising prices, such as the present, owing to the gradual increase in the cost of the animals forming the stock, and that any realisation during a period of high prices will result in considerable taxation liability. The equal and opposite situation will arise during a period of falling prices if the stock is treated as stock-in-trade. On the other hand, treatment on the capital basis will result in charging more to profits as the cost of replacement during a period of high prices with the equal and opposite situation in a period of low prices, and will result in excluding from taxation any profit on realisation during high prices or any loss on realisation during a low price period. If treated as stock-in-trade holding stock of the kind described may be written down to market value when prices fall, but if treated as capital must be maintained at a fixed price per head as far as taxation is concerned. It should, of course, be noted that the cost of

replacement must not include any element of improvement, and that considerable difficulty may arise in determining how much, if any, improvement is included in any stock purchased for replacement purposes. Casual sales of small numbers of stock or temporary reductions are not treated as 'capital' transactions. The decision as to which basis should be adopted is an extremely important one, and because it is difficult and involves some measure of estimation of the future, in particular the probable level of prices which will rule when stocks are realised, it should be given very serious consideration before a final decision is arrived at. Inspectors of Taxes will assume, in the absence of an election, that the stock-in-trade method is selected.

In order to obviate the difficulty of arriving at a cost valuation of certain items of stock-in-trade, such as live stock bred on the farm, it has been agreed that 85 per cent of the current market price may, for each of the years up to and including the year of assessment, 1944-45, be accepted as a measure of cost. Where, however, other satisfactory arrangements for arriving at cost have been in operation or agreed with the Inspector of Taxes, they may be retained. This arrangement is specially valuable to those who have no Excess Profits Tax liability, and who are forced to start accounts for the first time for assessment for the year 1942-43. If advantage, for instance, is taken of the provisions of Section 28 Subsection 5 referred to above, the first effective valuation for the purposes of tax may be as late as 31st March 1942. By that date the prices of farm produce were comparatively high as compared with those ruling in 1938 or 1939, and the adoption of 85 per cent of current market value as the basis of valuation results in throwing considerable profit into the period when assessments were based upon rental. If, as many believe, the 1942 prices represent peak prices, the gradual reduction resulting from adoption of this basis will be of advantage to the taxpayer. Careful consideration should, however, be given to the question of possible liability to Excess Profits Tax before adopting this basis.

Arrangements were also made that where the normal value of tillages, unexhausted manures, and growing crops does not exceed £700, a certificate that the value at the beginning of the year did not differ materially from that at the end of the year will readily be accepted, and that this arrangement may extend even when the normal value exceeds £700 after any inquiry necessary to establish its reasonable accuracy. This arrangement may assist certain farmers by enabling a detailed valuation to be dispensed with, but it should be carefully noted that, as a result of the orders of Agricultural Executive Committees, tillages and growing crops are probably at their peak, and the adoption of the procedure indicated may result in paying more tax than is properly due. Where farmers are able to do so, a detailed valuation of tillages and growing crops should be made and should be adjusted in the accounts from year to year.

Many farmers, on facing a demand for Excess Profits Tax at 100 per cent, are liable to take the view that they need not exert

themselves to continue making as much profit as possible. This is a mistaken view. Quite apart from the consideration that good farming is a necessary part of the nation's war effort, and that it is the responsibility and duty of all farmers to do their best in this national emergency, it should be remembered that the accumulation of an Excess Profits Tax balance is a form of insurance against bad times. Those who paid Excess Profits Duty during the war of 1914-18 will fully realise this fact, but as farmers were exempted from that tax it is perhaps not so generally realised as it should be that in a period of lower profits, which may easily recur, those farmers who do not reach their standard profits (whether that standard be determined on the basis of pre-war profits or on a minimum standard) can, if they have paid Excess Profits Tax, reclaim the deficiency of their profits up to the amount of the Excess Profits Tax which they have paid. Nothing can be reclaimed, however, if tax has not been paid, and the accumulation of a balance of Excess Profits Tax in the hands of the Revenue may, therefore, form an extremely valuable 'cushion' against less prosperous times. Whilst, therefore, no more tax should be paid than is properly due, it is desirable, in the interests of the individual and the nation alike, that the profits and the consequent tax should be as much as possible.

INSECT PESTS OF 1942.

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THE year 1942 could not be said to be characterised by any outstanding insect outbreak unless that of the Carrot Rust Fly, about the destructiveness of which complaints were received from widely separate parts of Scotland. Its co-partners of similar habits, the Cabbage Root Maggot Fly and the Onion Fly, continued to exercise the patience of both farmers and gardeners, and were, if anything, more abundant than in the two previous years. Approved methods of control for these pests did not always give the crops attacked the protection required, with the result that heavy losses were not uncommon. The Large Cabbage White Butterfly, swarms of which were the subject of general comment in 1940, was much less common in 1941, and in 1942 was quite rare. As an offset to the reduction of this pest of crucifers, there was a marked increase of the Cabbage Moth, which proved very destructive to both cabbages and cauliflowers.

Among pests of field crops reports of damage by the Gout Fly to barley came from the Lothians. Despite the increased acreage of converted grassland under crop, there continued to be very few cases of destruction by Wireworms and Leather-jackets. An interesting intense but small-scale infestation of the latter appeared unexpectedly in an Edinburgh city square, where the lawns had been replaced by cultivated plots a month or two earlier. Deprived of their natural food supply in the grass roots of the stripped turfs, the Leather-jackets made short work of cabbage and other transplants where they were not checked by arsenical poison bait.

With an increase in the acreage of sugar beet, greater attention is being paid to the insect and other pests of this valuable crop. 'Strangles,' the cause of which is not clear, accounted for about 5 per cent of a Lothian crop, and was of universal distribution. Black Aphis, which takes a heavy toll of sugar beet, gave promise of assuming large proportions in July, but fortunately the attack did not materialise.

In forestry two insects were noted as destructive—namely, the Spruce-larch Woolly Aphis (*Adelges viridis*), in a plantation of larch on Speyside, and the Spruce-cone Tortrix (*Cydia strobilella*), in Selkirkshire.

An interesting insect of nondescript status, an inhabitant of the nests of bees and wasps, was noted by a correspondent in Berwickshire. This insect, which is known as *Aphomia sociella*, lives gregariously in the nests as a caterpillar in long, buff, silken tubes, and in these it later pupates.

From Angus, Fife, and Perthshire came inquiries concerning the Rat-tailed Maggot, which occurs in middens in liquid highly charged with decaying organic substances. In the latter part of the article a few of the more common fly pests of live stock are illustrated and described, including Bot Flies, Warble Flies, and the Sheep Nostril Fly.

CARROT FLY (*Psila rosae*).

The Carrot Fly is widely distributed in the British Isles wherever carrots are grown, and is a serious pest under both farm and garden conditions. Besides carrots it attacks parsley, parsnips, and celery, but its depredations on the carrot crop are by far the most important. Among wild plants the fly is often found on the flowers of cow parsnip, wild chervil, and hemlock, from the roots of which it has recently been reared by Petherbridge, Wright, and Davies.¹

Description and Life-history.—The Carrot Fly (Fig. 3) is shiny-black, lightly suffused with green to blue in life, and with a wing-expanse of about $\frac{1}{2}$ in. The head is large and yellowish-brown. In the female the hind-end of the body tapers to the ovipositor; in the male it is bluntly rounded.

There are two generations of the Carrot Fly per year, the flies of the first generation appearing in May and June and those of the second in August and September. In the interval between the two generations there are always a few flies to be found and, again, they often persist late in the year.

In the field, according to Petherbridge, Wright, and Davies, the greatest concentrations of flies occur at the margins of a carrot crop and in the adjacent headlands and dyke-sides.

The eggs are about $\frac{1}{10}$ in. long, white and very faintly ribbed. They are laid in groups of three or four in small crevices of the soil, about $\frac{1}{4}$ in. below the surface and within a radius of $1\frac{1}{2}$ in. from the plant. Incubation requires seven to twelve days. Egg-laying by the first generation of flies reaches its maximum in June, and that by the second in late August and early September.

The larva is a typical maggot tapering to either end and completing its development in about one month, during which time it passes through three stages. When full grown it measures $\frac{1}{4}$ to $\frac{1}{2}$ in. in length, and is cylindrical, slender, shiny-yellow, and practically smooth. Immediately on hatching the maggot bores into the carrot at its lower end and tunnels upwards, making a gallery that every here and there opens to the surface exposing the maggots, which protrude by their tail-ends, and their dark-reddish excrement. From the carrots the maggots finally pass into the soil to pupate.

The puparium is cylindrical, pale yellow, darker at the ends, of which the anterior is flat and sloped off. Its length is no more than $\frac{1}{2}$ in. The period of pupation appears to vary, and from puparia formed in July flies continue to hatch for the rest of the summer.

¹ Petherbridge, F. R., Wright, D. W., and Davies, P. G. (1942). "Investigation on the Biology and Control of the Carrot Fly (*Psila rosae* F.)." Ann. App. Biol., Vol. XXIX., pp. 380-392.

Hibernation.—Contrary to the general opinion that the Carrot Fly hibernates in the pupal stage, it would appear that it usually spends the winter as a maggot in the carrot, since the maggots are found late in the year in unlifted carrots and late into the winter and early spring in carrots stored in clamps. As the winter advances the number of maggots in clamped carrots decreases, whilst the number of puparia in the adjacent soil increases.

Symptoms.—Maggot attack in carrots is reflected in the foliage, which first assumes a coppery-red hue and later changes to yellow in heavy infestation; ultimately the leaves collapse and wilt.

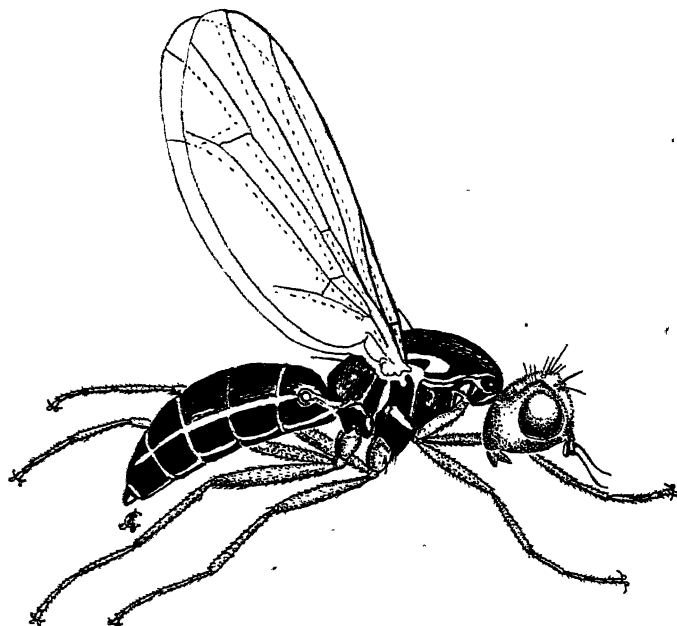


Fig. 3. —*Psila rosae*. Carrot Fly, female. $\times 15$.

From nature.

Affected carrots when lifted show exposed galleries and protruding maggots. Parsley, celery, and parsnips are all similarly attacked.

Damage.—Field crops are generally damaged most severely at the margins near headlands, where the flies tend to congregate amongst coarse vegetation. On this account there is a greater measure of egg-laying at the outer edges than at the centre, which explains why damage decreases as one proceeds from the margin towards the centre of the field. Usually, too, only a plant here and there is attacked, and losses are relatively much less than those occurring in small plots in gardens, which are often wholly ruined.

The actual damage done to carrots by the boring maggots is aggravated by the secondary invasion of slugs, millepedes, and wood-

lice, which may, again, be preceded or followed by rot-producing bacteria.

Carrots that are sown early and lifted for sale in bunches before they are mature frequently escape attack. Maincrop carrots, on the other hand, undergo a rapid deterioration in the autumn, which, according to Petherbridge, Wright, and Davies, is arrested by lifting the crop and storing it in clamps.

Control.—The measures that are practised in control of the Carrot Fly depend on the conditions under which carrots are grown, farm or garden, and the time at which they are sown, early or late.

1. *Rotation.*—On farms it is advisable not to grow carrots too often as an agricultural crop. Should they be grown in successive years, the current crop should be removed as far as possible from fields that carried carrots or parsnips the previous year. Badly infested crops should be lifted early and certainly should not be ploughed under, since the buried maggots will complete their development and produce flies in spring ready to lay eggs.

2. *Late Sowing.*—In gardens restriction of space does not permit of an effective rotation, but here partial control can be achieved by postponing the sowing of carrots until the end of May and beginning of June, whereby the crop may escape attack by the first generation of flies.

3. *Naphthalene.*—For early sown carrots crude naphthalene should be applied at the rate of 2 oz. per square yard, at intervals of ten days beginning at singling. Under field conditions, good results from naphthalene, applied at the rate of 200-300 lb. per acre, have been recently claimed by Hanson and Webster¹ in America.

4. *Poison Bait.*—Recent experiments by Petherbridge, Wright, and Davies (*loc. cit.*) indicate that a poison bait consisting of sodium fluoride (0.8 per cent) and cane molasses (2.5 per cent) sprayed on the vegetation of headlands temporarily reduced the population of the Carrot Fly locally. Unless the bait is frequently applied, the sprayed localities are soon recolonised by flies which arrive from adjoining untreated areas.

5. *Thin Sowing.*—To reduce subsequent thinning of carrots to a minimum, the seed should be sown thinly. It is frequently observed that an attack develops only after the crop has been thinned, and the simple explanation of this appears to lie in the fact that the flies are attracted by the strong odour given off by the exposed wilted thinnings. The latter should not be left on the ground but removed, and the soil drawn up to the rows.

THE BLACK APHIS OR BLACK "FLY" (*Aphis fabae*).

This insect, which is also called the Bean Aphis, has usually been associated in the minds of economic entomologists, farmers,

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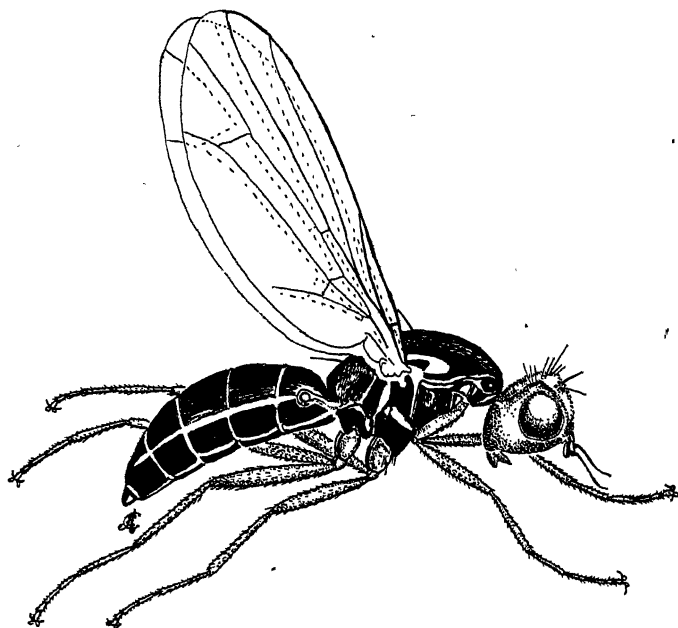


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and gardeners with the bean crop. Whilst there is no gainsaying its importance as a pest of beans, it is of even greater importance as a pest of sugar beet, the acreage of which has been greatly increased in the past three years to cope with the demand for a larger production of home-grown sugar.

Host Plants.—The Black Aphis is universally distributed and does not lack for variety of food-plants. Thus it is found on sugar beet, beet, mangolds, spinach, beans, poppy, thistle, dock, rhubarb, and white goosefoot. To these herbaceous plants there must be added certain woody plants like the spindle tree and the guelder rose, on which winter eggs are laid, predecessors of the first asexual generations of spring and early summer.

It must be realised that the Black Aphis exhibits an alternation of generations (sexual and asexual) in its life-cycle. The sexual

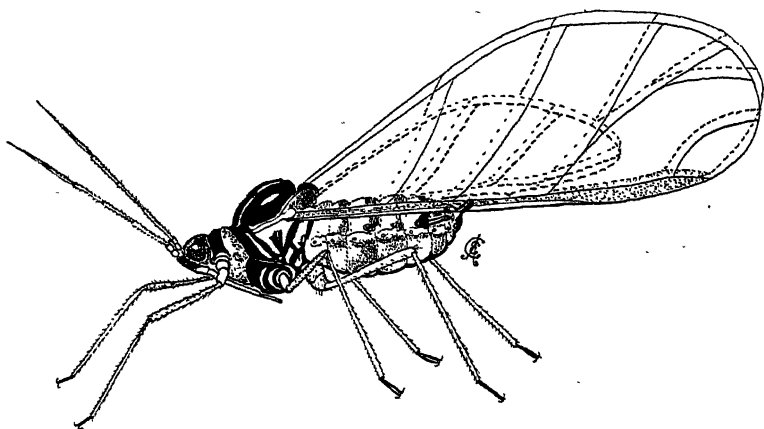


Fig. 4.—Aphis fabae. *Black Aphis, winged female.* × 10.
From nature.

generation occurs on the spindle tree and guelder rose, and these are referred to as *primary* hosts. The summer herbaceous plants, which support only asexual individuals, are the *secondary* hosts.

Life-history.—The general appearance of the Black Aphis is familiar to all. Both winged (Fig. 4) and wingless (Fig. 5) forms, which have a body length of $\frac{1}{10}$ in., are black or brownish-black, sometimes tinged with olive-green. The legs are lighter in colour.

On the summer plants the Black Aphis occurs in dense colonies near the tips of the shoots, and examination shows that they are composed of young forms of all stages, together with winged and wingless females. The winged forms pass from one plant to another spreading the infestation by establishing new colonies. The rate of reproduction is high, about five young daily with a total number of forty to fifty. Since the young may reach maturity in eight days in summer, the numbers of the Black Aphis produced in a single season are enormous. In autumn winged females are

produced on the summer plants and migrate to the spindle tree and guelder rose, where they give rise to wingless egg-laying females, each of which, after mating with a winged male that arrives from the summer host plants, lays a single black egg in a crevice of the bark. .

It is suggested that the fertilised female aphid may remain and deposit its winter eggs on the summer plants, or it may even continue to breed on herbaceous plants in sheltered places all winter.

The return migration from the spindle tree and guelder rose

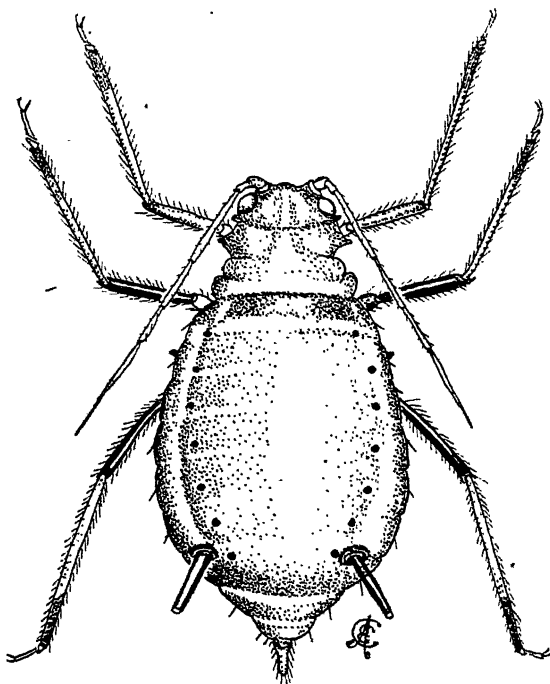


Fig. 5.—*Aphis fabae*. *Black Aphid, wingless female*. $\times 25$.
From nature.

occurs in May and June when winged forms, descendants of the parents which hatched from the winter eggs, fly to the summer plants.

Damage.—The Black Aphid damages the sugar beet and its other host plants by extracting the plant sap from the stems and leaves. In plants grown for seed, the aphid forms clusters at the tips of the flowering shoots and inhibits seed production. In field crops it settles on the young leaves, and by sucking the juices causes the leaves to curl and crinkle. The result is a check on the growth, which is later expressed in a reduced yield of roots. The last large-scale infestation of Black Aphid in Britain occurred in 1938,

and the losses then experienced demonstrated that this pest was one of the most destructive to sugar beet. Nor does its importance stop here, since the Black Aphis is the chief transmitting agent of two virus diseases affecting sugar beet—namely, Mosaic and Yellows.

Control.—In order to reduce infestations of Black Aphis, growers of sugar beet use nicotine dusts and sprays applied by hand-dusting machines and knapsack sprayers. The process of treatment is a laborious one and is not always attended by good results, since the tight crevices of crinkled leaves prevent insecticides from reaching the aphids inside. A large proportion, too, of the aphid population occurs on the under-surfaces of basal leaves, which are apt to be missed by dusts and sprays applied by ordinary methods. It has long been felt by growers that the results achieved in disinfecting a crop are by no means commensurate with the labour and expense involved, and this opinion applies not only to aphid attacks on sugar beet but to those of other low-growing crops like cabbage, broccoli, and Brussels sprouts in market gardens.

In 1939, as the result of the investigations of a private company, an apparatus was evolved for the more effective treatment of infested sugar-beet crops. Field tests were carried out in collaboration with the British Sugar Beet Seed Producers Association and the British Sugar Corporation, Ltd., and favourable results were reported.

The new method, which is essentially one of fumigation, depends for its efficacy upon the close confinement of the insecticide to the infested plants for such time, fifty to sixty seconds, as is required to destroy the pest. The gassing mechanism consists of a power-driven machine mounted on a chassis four feet high to clear the plants, and geared to travel one mile per hour. Behind, it drags a light, gas-proof sheet 40 feet wide and 100 feet long, fastened to an extension rod. The lethal agents used are either a mixture of nicotine gas and nicotine vapour, or nicotine dust, and it is claimed that 90 to 100 per cent of the aphids are destroyed. Cost of treatment varies from 44s. per acre for dusting, to 48s. per acre for gassing. Illustrated accounts of the machine in action have been published in the 'Sugar Beet Review,' May and July 1940, and in the 'Farmers' Weekly,' 25th July 1941.

THE SPRUCE-CONE TORTRIX (*Cydia strobilella*).

The Spruce-cone Tortrix is not an insect which is often noted by foresters, not because it is rare but because it does not ordinarily claim their attention. At the present time when home-grown seed must replace that from abroad, owners of conifer plantations harvest the cones in order to recover the seed, and any abnormal condition of the cones is duly noted. As a result of the examination of harvested cones from two localities, the one in Selkirkshire and the other in Northumberland, *Cydia strobilella* was identified, and its potential importance as a pest of conifers makes it worthy of description and discussion.

Description.—Examined with the naked eye the moth appears

small and dun-coloured. - Actually it has a wing-spread of about $\frac{1}{2}$ in., and under a lens magnifying ten diameters the front wings are seen to be brownish-black with the outer half of each reddish-brown, and crossed by irregularly curving, narrow, leaden-grey bands, interrupted in the middle. At the anterior margin of the wing there are five to seven equidistant, small, pale-yellow spots. The hind wings are blackish-grey with a whitish fringe. The underside of the body and wings is almost uniformly leaden-grey.



Fig. 6.—*Spruce cone bisected lengthwise. Three Caterpillars of the Spruce-cone Tortrix (Cydia strobilella) are present in the axis. Slightly enlarged.*

From nature.

The *caterpillar* (Fig. 6) is about $\frac{1}{2}$ in. when full grown, pale yellow, with light-brown head, and a few sparsely spread pale hairs on the body.

The *pupa* is yellowish-brown, about $\frac{1}{2}$ in. long. Each of the first five segments of the hind body has a double row of backwardly directed spines. Those of the second row are minute. The remaining segments have but a single row, and on the last are a few slender bristles hooked at the tip.

Food-plants.—The Spruce-cone Tortrix has been recorded from pine and fir as well as spruce. In the two localities from which it is here recorded, the host plant was Norway spruce.

Life-history.—There is but one generation each year, and the winter is passed as a caterpillar in the cones (Fig. 6). The moths, which fly during the day near the tops of the trees, are found on the wing in April and May. The eggs are laid by the female moths anywhere on the outside of the cones. After a short period of incubation the eggs hatch to produce the caterpillars, which bore into the cones and remain there feeding and tunnelling from June of one year until April of the next. When full grown the caterpillar pupates, and the pupa, by pushing between the scales, makes it easier for the adult moth to escape to the outside, when it is due to emerge from the pupal skin; this it does in a week or two.

Symptoms of Infestation.—Material evidence of a current attack of the Spruce-cone Tortrix is sometimes to be found in a distortion of the cones accompanied by an exudate of resin, and a marked arrest of development. More often, however, damaged cones appear to be quite normal, although they may be supporting anything from one to ten caterpillars. Signs of an infestation that is past are often represented by empty pupal cases projecting between the cone scales, left there by moths which have emerged and flown. The average number of cases per cone is an index of the intensity of the attack.

Forest Relations.—The activities of the caterpillars in the cones may affect the host tree in one of three ways—

(1) Infested cones may become detached and fall prematurely to the ground, where they may remain incompletely opened and prevent the escape of the seed. Thus the process of natural seeding suffers a check.

(2) There may be a reduction in the percentage germination of the seed. The higher the degree of infestation, the less the germinative capacity of the seed.

(3) The quantity of sound seed produced may be reduced often as much as by one-half.

Control.—(1) On the Continent numerous hymenopterous parasites of the Spruce-cone Tortrix have been recorded. In Sweden two of these are stated by Trägårdh¹ to have accounted for 30 per cent of *C. strobilella* in certain districts. In Britain the insect has not been intensively studied, but it would quite well repay investigation, as would other cone-inhabiting insects.

(2) The most economical and direct way of dealing with the pest would be to collect and destroy immature fallen cones.

THE DRONE FLY (*Eristalis tenax*).

Specimens of the maggots of this interesting and common insect were submitted for identification by farmers in Fife and Angus,

¹ Quoted by Escherich, K. (1931). 'Die Forstinsekten Mitteleuropas.' Vol. III, p. 377. Berlin.

and also by the proprietors of a Perthshire flax-retting plant, where the maggots were found in a settling tank.

In the course of its life-history the Drone Fly passes through four stages—namely, egg, larva or maggot, pupa and adult, and a brief account of these and of the habits of the insect will serve to facilitate its recognition.

Description and Life-history.—The Drone Fly (Fig. 7) is about $\frac{3}{8}$ in. long with a wing-spread of slightly more than 1 in. The body

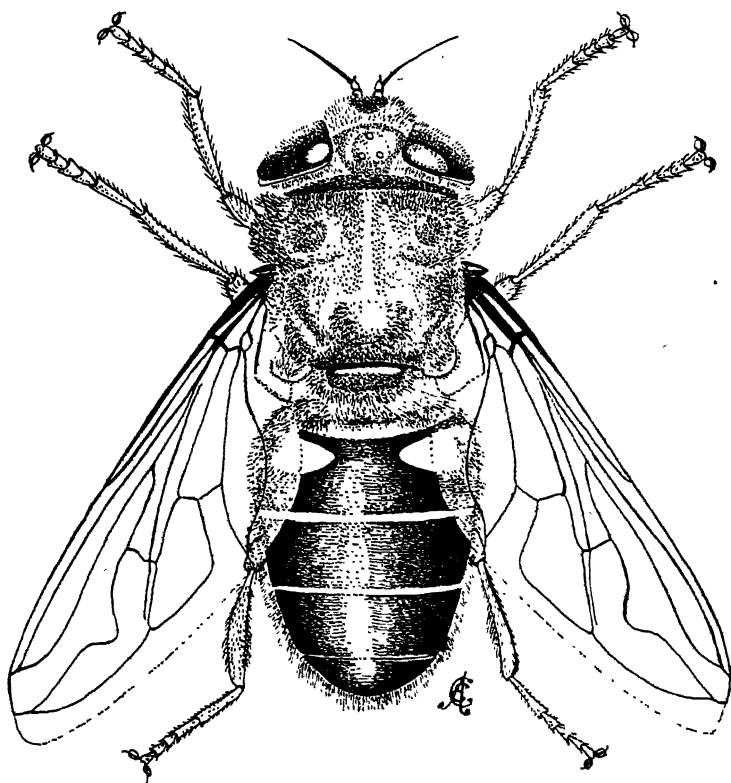


Fig. 7.—*Eristalis tenax*. Drone Fly, female. Adult of the Rat-tailed Maggot. $\times 5$.
From nature.

is clothed with tawny hair, and the blackish-brown colour of the body-wall is relieved by two large reddish-yellow marks, represented as unshaded in the accompanying illustration, at the base of the hind body. The legs are black, banded with yellow or reddish-yellow, and there is a distinct loop on the apparent fourth vein of the wing, which is not present in the smaller, more gaily coloured *Syrphus ribesii* (Fig. 8). Behind the looped vein lies the false vein.

The sexes are readily distinguished by an examination of the head. In the male the eyes occupy the greater part and are in

contact; in the female, on the other hand, there is a wide gap between the eyes.

On a warm summer day the female may be seen buzzing over liquid manure, excrementitious matter, and even decaying animal carcasses, alighting every now and then to lay its white eggs. Always there must be a plentiful supply of moisture to satisfy the requirements of the larva or maggot, which duly hatches from the egg. The maggot as it grows is a dirty white colour, with a tough integu-

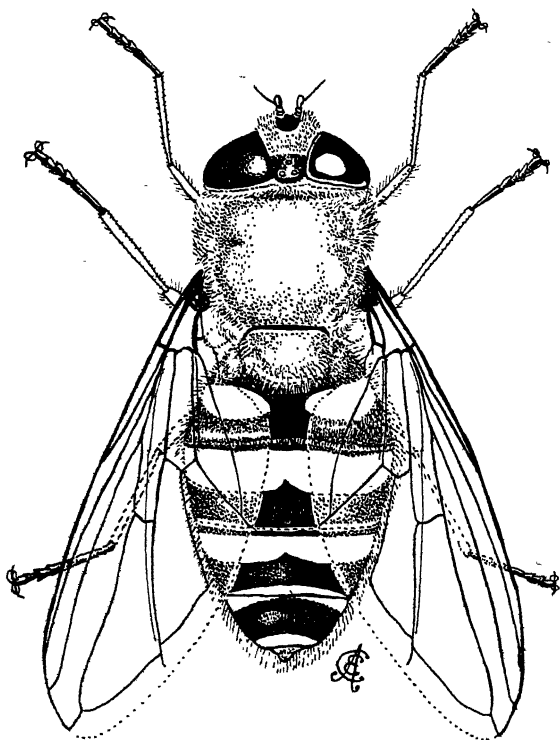


Fig. 8.—*Syrphus ribesii*. *Common Hover Fly, female*. The maggot of this fly destroys greenflies. $\times 6$.

From nature.

ment that is invested with minute hairs. The remarkable feature of the larva is its long slender tail, consisting of three telescopic sections, which has earned for it the name of Rat-tailed Maggot (Fig. 9). Other features which one will note in the figure are the seven pairs of stump-like legs and the apparent absence of head, which is minute and retracted. In the full-grown maggot the body is more slender than a pencil. The length of the body varies with the degree of extension of the tail, which is really composed of the last three body segments. The thicker anterior part of the body

is slightly more than 1 in. long, and the tail may be anything up to three inches or more according to the degree of extension.

Removed from its natural aquatic habitat, the maggot can travel with ease like a caterpillar, using its stump-like legs for the purpose. Just before it is ready to pupate, it wanders into the surrounding drier soil and pupates below the surface. At pupation the last larval skin is retained as a protective case for the pupa, and near the front end of the case two pairs of slender, short horns are thrust out. The longer second pair of these is the breathing organs of the pupa. The larval tail persists after pupation and is carried recurved over the upper surface of the pupal case.

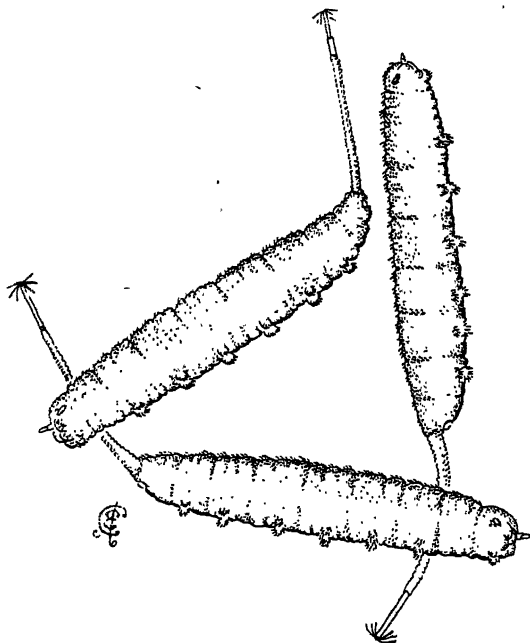


Fig. 9.—Rat-tailed Maggots, larvæ of *Eristalis tenax*, Drone Fly. $\times 2$.

From nature.

Habits.—Agriculturally speaking, the Drone Fly is not injurious, but its occurrence in the vicinity of farms and elsewhere is indicative of insanitary conditions that require attention. Occasionally the maggot is accidentally ingested by human beings and domestic animals, especially the pig. Its presence in the intestine of man may be accompanied by nausea, but in the pig it probably causes little inconvenience. For the rest, its particular rôle in the economy of nature appears to be the disposal of putrescent substances of animal origin, a rôle which it shares with a host of carrion flies and beetles.

Relatives of the Drone Fly.—The popular name of drone applied

to the fly has been derived from the designation of the male honey-bee, which it resembles in form and colour. This similarity of the two led to a confusion in the minds of the ancients, who imagined that bees developed from the carcasses of animals. Resemblance to bees and also to wasps is a character which is by no means confined to the Drone Fly, but is a common attribute of many other members of the family *Syrphidae* or Hover Flies, to which the Drone Fly belongs. All the *Syrphidae* are expert fliers, now hanging on the wing before some gaily coloured flower, and again making darting flights with such speed that they become momentarily lost to the eye.

To the layman Hover Flies are chiefly known as the parents of maggots which perform a useful service by destroying greenfly, as, for example, *Syrphus ribesii* (Fig. 10). A few, again, are destructive to Narcissus bulbs (*Merodon* and *Eumerus*), while others are found as scavengers in the nests of bees and wasps (*Volucella*). A curious snouted hover fly (*Rhingia*) has recently been recorded by Coe¹ as breeding in cow-dung.

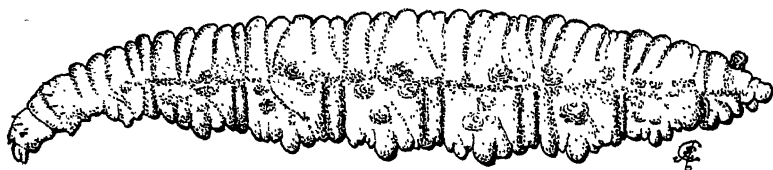


Fig. 10.—Maggot of the Common Hover Fly, *Syrphus ribesii*. × 6.
This insect is an important enemy of greenfly.

From nature.

FLY PESTS OF LIVE STOCK.

From May to October *blood-sucking* flies like the Cleg, Stable Fly, Black Flies, and Midges cause a good deal of annoyance to live stock. To the individual farmer these insects are just so many flies which enjoy a short period of activity in summer, and are usually dismissed as of little consequence. It is true that the immediate result of their attacks may not seem to be significant. Having pricked the host's skin, they each withdraw a minute quantity of blood and leave behind a tiny exuded droplet of the same, marking the site of the puncture. In Britain we are fortunate in that our native blood-sucking flies are not vectors of any important pathogenic organisms affecting stock. Sheep are known to harbour a harmless trypanosome, *T. ovis*, which is transmitted by the Sheep Ked, and the Cleg and other blood-sucking flies have been suspected of carrying the likewise harmless *T. theileri* of cattle. Among midges, *Culicoides nubeculosus*, a common and minute blood-sucker, transmits to horses the parasitic nematode worm, *Onchocerca*

¹ Coe, R. L. (1942). *Rhingia campestris* Meigen (Dipt. Syrphidae). Ent. Mon. Mag. Vol. 78, 121-130.

cervicalis, believed to be associated with poll-evil. A closely related worm in cattle, *O. gutturosa*, has been shown to be carried by the common blood-sucking Black Fly, *Simulium ornatum*.

Apart, then, from the chance of secondary bacterial infection of the bite-punctures made by insects in search of a blood-meal, the health of stock is not likely to be seriously affected by the attentions of blood-sucking flies provided they are not so numerous as to launch mass attacks on their hosts. Even in the case of moderate infestations, however, the persistent pestering to which grazing animals are submitted induces impoverishment, and this, in dairy cattle, may result in a reduction of the milk yield.

The relationship of *non-blood-sucking* flies to live stock is on a plane somewhat different from that of their blood-sucking relatives in that, for some at least, it involves the factor of compulsory larval parasitism, which has no doubt evolved from the simpler food-type association of the adults. In contrast to blood-sucking flies, non-blood-sucking ones are incapable of tapping blood-vessels, and so they have recourse to secretions of the skin and mucous membranes, exudates of wounds, or even organic material adhering to the coat in order to satisfy their appetite for protein. In that a protein element in the diet appears to be essential for reproduction in many insects, an enlargement of the association of fly and host so that the latter provides food not only for the fly itself but also for its larva, seems a not unnatural sequence of events.

Under these modified conditions the host assumes a new status in relation to the fly, for it is now attractive not only as a source of food but also as a medium for breeding, including the process of egg-laying and the subsequent development of the larvæ or maggots.

The degree of dependence of non-blood-sucking flies on live-stock hosts varies with the species. House-flies and their allies are apt merely to be temporary visitants in search of whatever food may be available. In carrion flies the association of fly and living host is no closer than in house-flies, since they are more attracted by carrion than by living animals, unless the latter are diseased. The marked exception to this rule is the Sheep Maggot Fly (Fig. 11), which appears to be seceding from the carrion-breeding habits of its relatives, other metallic Blue-bottle and Green-bottle Flies, and, with choice unrestricted, almost invariably selects a *living* sheep host rather than carrion for oviposition. A tendency to select specific hosts becomes greatly emphasised in œstrid Bot and Warble Flies, the different kinds of which tend to specialise on particular kinds of hosts or, at least, on ones that are closely related like sheep and goats or, again, horse, donkey, and mule.

The relationship which exists between flies and the larger animals wherein the maggots of the former occur in the living tissues of the latter is described as *myiasis*, and there follows an account of the habits of some of the more common of these flies about which inquiries are made by farmers. It is natural that farmers should be more familiar with the maggots than they are with the flies, since it is the former with which they have to deal in infested animals. It is important, however, that they should be

able to recognise the flies which produce the maggots and learn something of their habits, if they are to exercise effective control over those important pests.

Æstridæ.—In agriculture the *Æstridæ* is one of the most interesting and most important families of flies. The maggots of its members are parasitic, some in domestic and others in wild-game animals. The best-known representatives of the family native to Britain

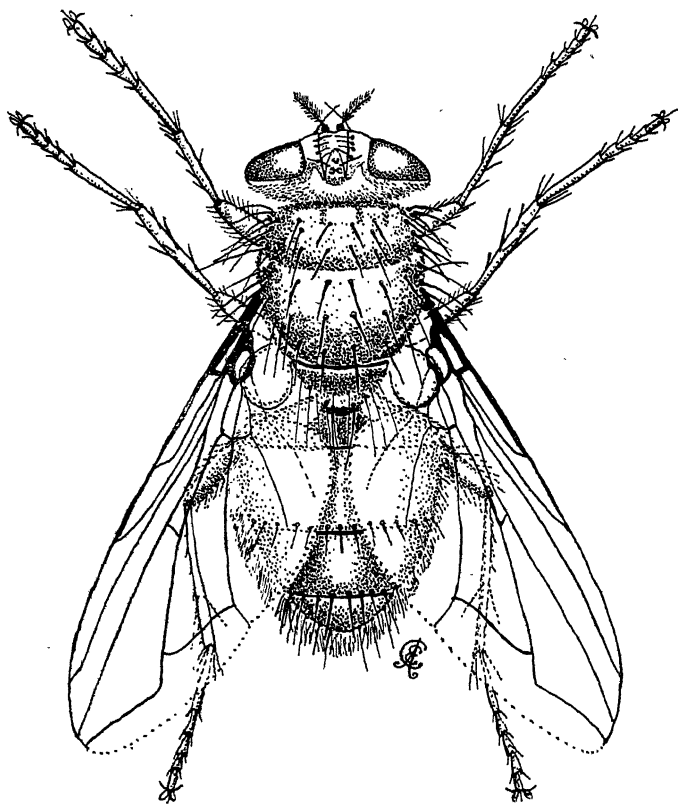


Fig. 11.—*Lucilia sericata*. *Sheep Maggot Fly or Green Bottle Fly, female*. $\times 9$.
From nature.

are the Bot Flies, Warble Flies, and the Sheep Nostril Fly, the maggots of which choose each a specific lodgment in its host—namely, the food-canal, skin, and nasal cavities respectively. The character which more than any other brands the *Æstridæ* is the reduction of the mouth-parts to functionless vestiges so that the fly is incapable of ingesting food. Its whole energies, therefore, are devoted to the finding of appropriate mammalian hosts and the subsequent disposal of its eggs or living larvæ in particular parts of the host's body.

BOT FLIES (*Gastrophilus*).

That horses suffered from Bots was well known in early times, and reference is made to them in three Shakespearean plays—namely, 'Henry IV.,' Part I., Act II., Scene 1; 'Taming of the Shrew,' Act III., Scene 2; and 'Pericles,' Act II., Scene 1.

Kinds.—In Britain there are three kinds of Bot Fly: the Common Bot Fly (*G. intestinalis*), the Throat Bot Fly (*G. nasalis*), and the Nose or Lip Bot Fly (*G. hemorrhoidalis*), of which the two last are much less common than the first. In U.S.A. and Canada all

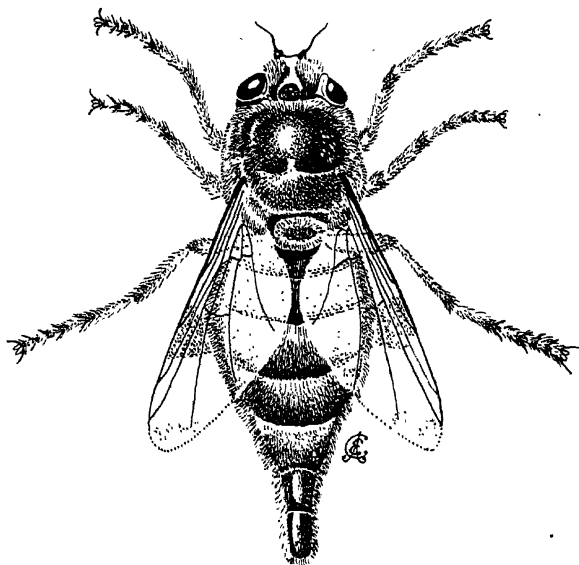


Fig. 12.—*Gastrophilus intestinalis*. Common Bot Fly, female. $\times 4$.

From nature.

three species are prevalent, and judging by the activities of the flies in summer, as well as by the numbers of the three kinds of Bots observed in post-mortem examinations, I would say that their incidence is much higher in North America than it is in Britain, particularly so in the Western States and Provinces.

Description.—1. *Adults*.—The Common Bot Fly (Fig. 12) is a robust insect, about the size and appearance of a humble-bee, and tawny in colour. It has a wing-spread of about 1 in., and on the outer half of each wing there is a transverse smoky band and one or two similar smoky spots at the wing-tip. In the female the end of the body is continued into a tubular ovipositor, which is tucked away under the body (Fig. 13); in the male the end of the body is evenly rounded and is armed with a pair of black hooks

on the underside. With ovipositor extended the female measures about $\frac{3}{8}$ in., but only about $\frac{1}{2}$ in. with ovipositor recurved underneath.

The Throat Bot Fly is about $\frac{5}{12}$ to $\frac{1}{2}$ in. long without ovipositor and $\frac{3}{8}$ in. including the latter. Its wing-spread is $\frac{5}{8}$ in. As regards colour, its two most conspicuous characters are the dense, rusty-red pile of the thorax and the transverse median black band of the hind body, which separates the basal and apical bands of pale yellow hair. In the male this median band is clothed with rusty-red hair like that of the thorax.

The Lip Bot Fly is the smallest of the three, measuring only $\frac{2}{5}$ in. without the ovipositor, and has a wing-spread of slightly less than $\frac{4}{5}$ in. Its colour scheme is black, relieved by bands of varicoloured hair, of which the anterior of the two thoracic is yellow and the hind one black. On the abdomen are three bands of hair,

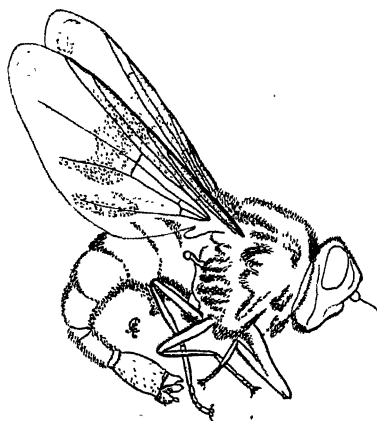


Fig. 13.—*Gastrophilus intestinalis*. *Common Bot Fly, female*. $\times 4$.
The egg-laying tube is recurved under the body.

From nature.

the foremost white, median black, and the end one orange-red. The last is conspicuous in such degree that the insect is frequently named the Red-tailed Bot Fly.

2. *Eggs*.—The eggs (Fig. 14) of the three Horse Bot Flies are readily distinguished. They range in size from $\frac{1}{10}$ in. to $\frac{3}{10}$ in. The egg of the Lip Bot Fly (Fig 14, 3) is readily distinguished from those of the other two by its black colour and long basal stalk, which is almost equal in length to the egg proper. It is somewhat compressed like that of the Common Bot Fly (Fig. 14, 1) and unlike the cylindrical egg of the Throat Bot Fly (Fig. 14, 2). The position of the lid or operculum is different in each, oblique and terminal in that of the Common Bot Fly, terminal and dome-like in that of the Throat Bot Fly, and sub-terminal and lateral in that of the Lip Bot Fly, which has, also, the fore end distinctly squared off. All the eggs are transversely striated, and the striations are more

deeply impressed in those of the Lip Bot Fly than in the other two species.

3. *Larvæ*.—The maggots or Bots are encircled with segmental bands of spines, single-rowed in that of the Throat Bot Fly (Fig. 16, 1) and double-rowed in the others. Bots of the Common (Fig. 16, 2) and Lip Bot Flies (Fig. 16, 3) differ in the relative size of the spines. In the former they are larger and more conspicuous.

Life-history.—There is but one generation of Bot Flies per annum, and the cycle begins with the eggs which are laid during the summer and early autumn by the adult flies. According to the species, the female lays anything from 150 to 750 eggs, and during bright warm days egg-laying proceeds almost continuously from early forenoon to late afternoon. The eggs are fastened to

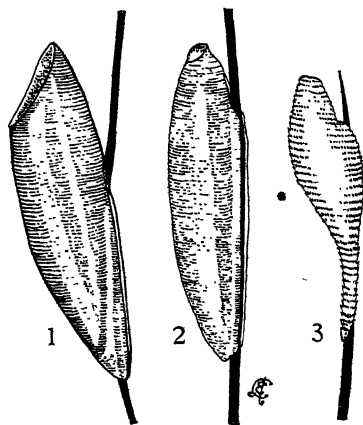


Fig. 14.—Eggs of Horse Bot Flies. (1) Egg of *G. intestinalis*, Common Bot Fly. $\times 36$ (2) Egg of *G. nasalis*, Throat Bot Fly. $\times 36$. (3) Egg of *G. hæmorrhoidalis*, Lip Bot Fly. $\times 24$.

From nature.

the hair by a pair of long clasps and cement (Figs. 14 and 15). Usually there is but a single egg per hair, but the Throat Bot Fly often lays as many as four, and perhaps more (Fig. 15), on a single hair.

Incubation of the eggs takes a week to ten days, and if the newly hatched maggots are to complete their development they must pass, or be conveyed, to the mouth of the host. Once inside the mouth they penetrate the lining, and, working their way slowly down the walls of the throat and gullet, they reveal themselves again in the stomach or intestine. There they attach to the lining by their strong, curved mouth-hooks and remain till the following May or June, when they release their hold, pass down to the anus, and are deposited with the dung on the ground.

In crevices of the soil or under tufts of grass in pasture the maggots change to reddish-brown or black pupal cases, from which

in three or four weeks the flies extricate themselves, and, after pairing, the females commence egg-laying.

Host Relations.—Horses do not welcome the attentions of Bot Flies, and sensitive animals display their dislike either by attempting to ward off the offenders or by having recourse to flight. Throat and Lip Bot Flies elicit a nodding response from their hosts, and to protect themselves against the former horses will contentedly rest their heads on each other's backs, whilst against the latter they keep their heads down, rubbing their lips on the ground. Of the Common Bot Fly, horses are much less apprehensive than they are of the other two.

Although a horse may support a large number of Bots without any seeming inconvenience, it cannot therefore be concluded that they are of minor importance. The lesions made by numerous pairs of mouth-hooks anchored in the lining of the gut must be a source of pain and irritation, not to mention infection. Maintenance of a mass of Bots means abstraction of food which would otherwise contribute to the host's nutrition, elaboration of secretions and excretions by the parasites that may be toxic to the host, and interference with the normal passage of food along the host's gut.

Control.—Since Bots pass the winter in the stomach of horses, they can best be controlled by treating infested animals with a vermifuge which will effect their expulsion. For this purpose carbon bisulphide is administered in gelatine capsules at the rate of $1\frac{1}{2}$ fluid drachms per 250 lb. of body weight. The treatment requires the services of a veterinary surgeon, and its efficacy in terms of reducing the popula-

tion of Bots in a district depends upon the concerted action of all farmers.

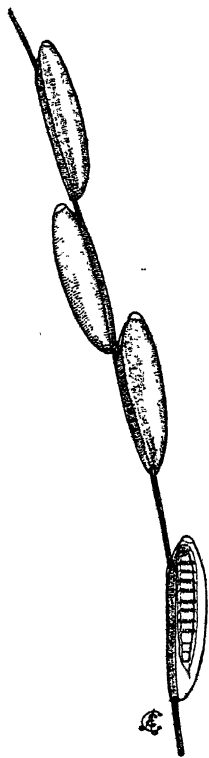


Fig. 15.—Eggs of *G. nasalis*, Throat Bot Fly. $\times 16$.

Four eggs on a single hair. Lowest egg represented as transparent to show the larva ready to hatch.

From nature.

OX WARBLE FLIES (*Hypoderma lineatum* and *H. bovis*).

Control.—In 1936 the Minister of Agriculture and Fisheries introduced the Warble Fly (Dressing of Cattle) Order, which made it incumbent on all owners to destroy the maggots of Warble Flies in cattle visibly infested. To this end owners were instructed to dress affected animals with an effective wash, derris or such-like.

at monthly intervals commencing not earlier than 15th March and ending not later than 30th June each year. As an alternative to dressing, it was open to farmers to remove all mature maggots from the backs of infested cattle by compression or other mechanical means at intervals of ten days beginning not earlier than 15th March and continuing so long as the maggots appeared, but not subsequent to 30th June. .

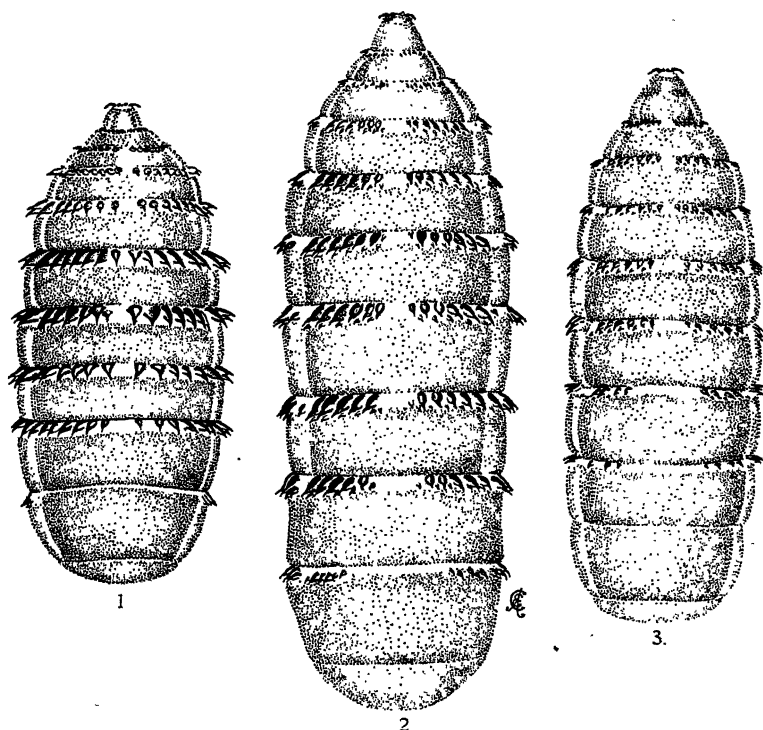


Fig. 16.—Larva of Horse Bot Flies. (1) Larva of *G. nasalis*, Throat Bot Fly. $\times 4$. (2) Larva of *G. intestinalis*, Common Bot Fly. $\times 5$. (3) Larva of *G. hæmorrhoidalis*, Lip Bot Fly. $\times 4$.

From nature.

In February 1940 the compulsory Order was suspended, but this is not to say that farmers should not continue voluntarily to practise control by whatever means are available. Indeed, it would be a short-sighted policy on the part of farmers to slacken their efforts now and allow the situation as regards warble infestation to deteriorate after so much ground had been gained by the operation of the Order over a period of four years.

At present farmers may find it difficult to obtain supplies of derris, the active, insecticidal component which has usually been

employed in anti-warble dressings. In its absence they are recommended to dress their cattle with a wash consisting of—

Nicotine sulphate	2 oz.
Hydrated lime	1 lb.
Water	1 gal.

The lime is placed in a vessel of appropriate capacity, and water added slowly with stirring to prevent the formation of lumps, and the nicotine sulphate then added. Since the mixture does not retain its lethal properties with keeping, it should be freshly prepared just before it is required for use. The dressing, which kills the maggots by direct contact, must be introduced into the warble swellings, and this is accomplished by means of a cloth or brush wetted with the dressing and rubbed along the backs of the cattle in such a way that it has every chance of percolating through the maggot-made pore in each warble swelling.



Fig. 17.—Eggs of *H. lineatum*, *Heel Warble Fly*. $\times 20$.

One egg is represented as hatched, with maggot emerging.

From nature.

Farmers may ask why cattle should require to be treated with warble dressing at monthly intervals. The reason is that the maggot spends a month in the skin of the host's back before it becomes mature, emerges, and drops to the ground. The prolonged season of treatment, March to June, is explained by the fact that the maggots appear in the back

periodically any time from February to June.

There are few pests of live stock which lend themselves so readily to control in the host as do warble maggots. This susceptibility to control is due to the fact that—

- (1) Cattle are the only hosts. The odd warble in horses is the exception.
- (2) Warbles are confined to the backs of cattle from withers to tail.
- (3) Warbles occur in the backs of cattle for a limited season, February to June.
- (4) Each warble is provided with a pore of communication with the exterior.

Migration of Warble Maggots.—The warbles present in the backs of cattle in the spring of the year are the end-point of a lengthy migration, which began some time between June and August of the previous year when minute maggots hatched from eggs (Fig. 17) fastened to hairs on the hind-quarters or flanks of the host, but never on the back. The route taken by the maggot is a circuitous one in which, for the greater part, it squeezes its way along connective-tissue pathways of the muscles under the skin, but later deviates from its normal course to enter the wall of the gullet or the canal of the backbone. The consensus of opinion now seems

to be that the maggot of the larger of the two Warble Flies, *Hypoderma bovis*, unlike that of the smaller Heel Fly, *H. lineatum* (Fig. 18), rarely enters the wall of the gullet; on the other hand, the maggot of *H. bovis* usually enters the spinal canal, a route which is shunned by the maggots of *H. lineatum*.

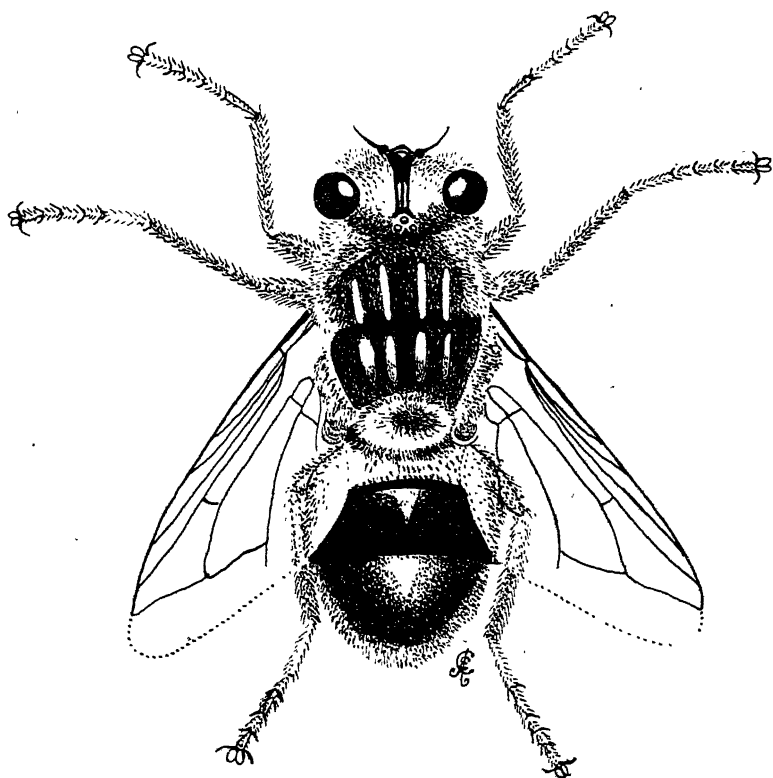


Fig. 18.—*Hypoderma lineatum*. Heel Warble Fly of Cattle, female. $\times 6$.
From nature.

THE SHEEP NOSTRIL FLY (*Cephalomyia ovis*).

Specialisation among parasitic insects has led to the adoption of many curious habits, and none more so than that of the Sheep Nostril Fly, which has selected the nasal cavities of its host in which to spend the larval period of its existence.

Host Reaction to the Fly.—The fly is active during the summer months, and is especially attentive to sheep on warm sunny days, when its presence in a flock is soon reflected in the peculiar behaviour of the members. The sheep tend to keep close together with their

heads lowered so that the nostrils almost touch the ground. The purpose of this reaction is protective, and appears to be instinctively undertaken in order to nullify the strike of the fly by reducing the exposure of the vulnerable nasal openings.

Description.—*Adult*—The fly (Fig. 19) which is the source of all this trouble is about half an inch in length with a wing-spread of about $\frac{3}{4}$ in. The head and thorax of the fly are light-brown and closely set above with small, round, black tubercles. The eyes are brown and, below, the face is puffed out and white. The abdomen is black or brownish and marbled with a silvery lustre. As compared with Warble and Bot Flies, the Sheep Nostril Fly has a very

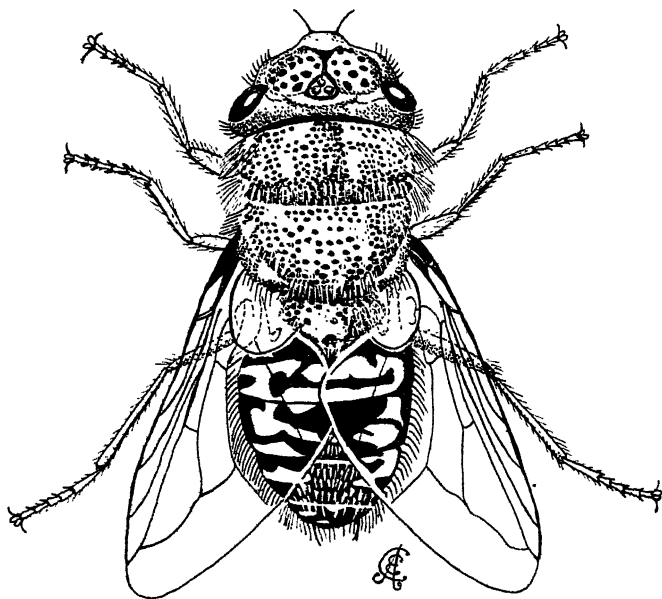


Fig. 19.—*Cephalomyia (Oestrus) ovis*. Sheep Nostril Fly, female. $\times 6$.
From nature.

scanty covering of hair, and it is all the more inconspicuous because the individual hairs are short and pale. The wings are glassy with yellow veins, and the basal lobes or squamæ are waxy-white and large. The legs are yellow.

As regards reproduction, it is interesting to note that the Sheep Nostril Fly does not lay eggs, but first-stage larvæ.

The Larva.—The maggots at first are minute, no larger than $\frac{1}{16}$ in., but by feeding, growing, and moulting the larva ultimately attains to a length of $\frac{3}{4}$ to 1 in. (Fig. 20). The colour is white, with dorsal segmental bands of brown in older individuals. In shape the maggot is arched above and flat beneath, slightly tapering in front and squared off behind, except for a step-like process with

two papillæ, which projects backwards. Beneath these are nine segmental bands of from two to four rows of spines. On each side of the body there are two rows of fleshy tubercles.

The Puparium.—Dark-brown to black in colour. It is found in the soil under tufts of grass or beneath stones, and the fly makes its escape from the puparium at any time from three weeks to two months.

Life-history.—Infestation of sheep begins when the female fly drops its larvæ into the nasal cavities. This is adroitly accomplished by the fly, which darts at the nose of the sheep. As if to ward off attack the sheep rapidly uplifts its head and thus presents the fly with the opportunity which it seeks. It seems but a fraction of a second that the fly hangs on the wing over the upraised nostrils of the host, but this brief interval is sufficient for the fly to drop a living larva into the nasal openings.

In the further development of the maggots in the nasal cavities, a marked variation in the rate of growth is noticeable. Some remain as minute first-stage larvæ in the lower nasal passages

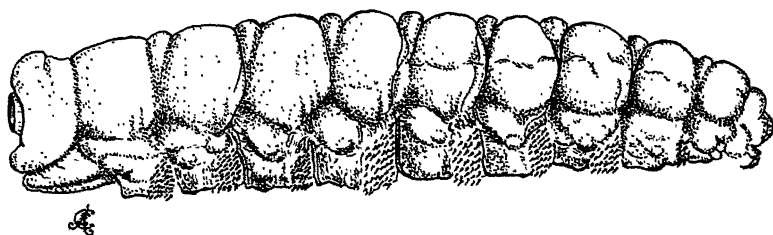


Fig. 20.—Maggot of *Cephalomyia (Oestrus) ovis*. *Sheep Nostril Fly*. $\times 5$.

From nature.

from September to February, whereas older and larger larvæ may be found at the same time in the upper parts of the passages and their offshoots, the frontal and maxillary sinuses. Thus at any one time in various parts of the respiratory ducts a mixture of larvæ of all stages of development may co-exist. It has been suggested that inhibition of growth of first-stage larvæ may be a matter of temperature. In the lower nasal passage where they occur they are subject to continual cooling by the incoming stream of air which becomes warmed up as it passes over the turbinate folds of the upper passages, where the older larvæ occur. Such an argument, however, fails to recognise that the inhibited maggots are equally subject to the influence of the warm outgoing current, so that temperature in itself is not an adequate answer to the question of their retardation of growth. The period of larval development is about ten months. When full grown the larvæ in the nasal sinuses return to the nasal passages and are ejected by the snorting and sneezing of the host.

Symptoms.—Infested sheep are recognised by a purulent dis-

charge from the nostrils. Affected animals shake their heads vigorously and tend to step high as they walk. An occasional maggot is expelled by sneezing. Other symptoms that have been noted are grating of the teeth, pawing with the front feet, and inco-ordination of movements not unlike that of true gid due to the brain tapeworm-cyst of the sheep (*Oenurus cerebralis*). By reason of this similarity of symptoms, the term 'false gid' has been applied to the condition for which the maggot of the Sheep Nostril Fly is responsible.

Damage.—Heavily infested sheep lose condition, due to the constant irritation set up by maggots in a highly sensitive site. Again, at the lesions made by the mouth-hooks of the maggot there is always the risk of a secondary bacterial infection. More important, perhaps, than either of these kinds of damage is the bronchial and lobar types of pneumonia which succeed the accidental migration of maggots to the lungs *via* the glottis and trachea. Cases of such pneumonia have been recorded in Britain,¹ Africa, and India.

¹ Bisset, N., 1931. "The possible association of the Sheep Nostril Fly (*Oestrus ovis*) with Pneumonia in Sheep." *The Welsh Jour. Agric.*, Vol. VII., pp. 363-367.

AGRICULTURAL RESEARCH IN SCOTLAND IN 1942.

BEING A BRIEF SUMMARY OF THE WORK AT THE
SCOTTISH AGRICULTURAL RESEARCH
STATIONS DURING THE YEAR.

*Readers desiring fuller information on any of the subjects mentioned
should write to the Director of the Station at which the investigation
is being carried out.*

INSTITUTE OF ANIMAL GENETICS.

UNIVERSITY OF EDINBURGH, WEST MAINS ROAD.

Dairy Cattle.—The problem of reproductive efficiency in cattle is of considerable importance in relation to immediate supplies of milk, to the practical application of artificial insemination, and to the long-term process of improvement by selection. Various methods of approach to the problem are in progress. The breeding programme designed to throw light on the inheritance of milk production is being continued, and the variously bred animals are now contributing usefully to this question as well as to that of reproductive efficiency and related questions.

Pigs.—Experimental matings to test the possibility of using an inbred strain to secure better results from cross-breeding are being carried out. The mothering qualities of sows and the structure of the pedigree industry in relation to its functions and opportunities have also been studied.

Poultry.—Genetical and physiological investigations on reproductive activity in the Brown Leghorn fowl are being pursued.

ANIMAL DISEASES RESEARCH ASSOCIATION.

MOREDUN INSTITUTE, GILMERTON, MIDLOTHIAN.

The investigations upon which the Association has been engaged in recent years are being continued. These include grass sickness in horses, lactation tetany in cows, white scour and allied diseases

in calves, scrapie, enzootic abortion in sheep, and pining in sheep and young cattle.

This year the systematic investigation of parturient redwater in cows has been commenced and arrangements are being made for the Association to take part in a co-operative programme of research, designed on a national scale, upon the important problem of mastitis in dairy cows.

THE ROWETT RESEARCH INSTITUTE.

BUCKSBURN, ABERDEEN.

The main objective of the Duthie Farm, the experimental farm of the Institute, is maximum food production, and demonstrations of methods to achieve this. The milk output has been more than doubled, and an increasing proportion of home-grown foods is used. The making of grass silage has now passed from the experimental stage, and the pit method has been adopted as the cheapest, most practical, and least wasteful. Different grazing methods and various forms of pasture management, designed to make more of the grass crop, have been tried and demonstrated to farmers.

Investigations into the losses and changes in food values of potatoes during storage are in progress. Possible improved methods of cultivation and of storage are also being tried out.

A large number of cattle on various farms throughout the North-East of Scotland have been weighed, and are under observation to try to determine whether there are unexplained differences between farms in their ability to fatten cattle.

The main work of the farm, apart from food production, is the education of farmers by conferences and demonstrations in up-to-date methods.

THE SCOTTISH PLANT BREEDING STATION.

CRAIGS HOUSE, CORSTORPHINE, EDINBURGH.

Experimental work on the breeding of cereals, potatoes, herbage plants, swedes, and kales is in progress at the Station. Each year it is customary to describe briefly in the 'Transactions' one section of the work, and on this occasion that dealing with potato breeding will be reviewed.

In the interval since 1938, when the potato-breeding work was last described in the 'Transactions,' experiments have been continued with the object of producing improved commercial varieties possessing, as far as possible, inherent resistance to the more important diseases such as blight, mosaic, and leaf roll. There is ample scope for effecting improvement in potato production by obviating losses through the ravages of these diseases, and this line of work is being actively pursued.

The breeding of blight-resistant varieties is complicated by the occurrence of biotypes, or what may be called different strains, of the fungus which causes blight. The fungus appears to comprise a common form of wide distribution together with a number of more or less isolated biotypes. One such biotype proved to be much more virulent than the common strain, and was able to destroy certain seedlings which had previously shown complete resistance to blight under natural field conditions.

The variety of Mexican potato (*S. demissum*) employed in breeding for resistance to blight was completely resistant to both strains of the disease. Seedlings bred from it by crossing and by subsequent back-crossing to cultivated varieties consisted of three types, viz. :—

- (1) Plants resistant to both strains.
- (2) Plants susceptible to both strains.
- (3) Plants resistant to the common strain but susceptible to the more virulent biotype.

The most desirable type is that resistant to both strains, and several selections so constituted have been included in trials with common varieties that are widely grown, and they have given encouraging results.

Breeding work involving the crossing of the wild species of potato (*S. demissum*—72 chromosomes) with cultivated varieties (48 chromosomes) is handicapped by pollen sterility induced by unbalanced chromosome complements. This difficulty, however, has been overcome by crossing *S. demissum* with another species of potato (*S. Rybinii*—24 chromosomes), and thus obtaining a 48-chromosome hybrid which crosses readily with cultivated varieties. The triple hybrids and subsequent back-crosses exhibit an exceptionally high degree of pollen fertility, and many of them are resistant to both strains of blight.

The most advanced seedlings in the investigations have proved to be resistant to the common strain of blight only. So far, this level of resistance has provided adequate protection in the field. Several of the seedlings have been widely tested and have shown prospects of attaining commercial standard. They are good croppers, producing attractive tubers of excellent table quality. Some of them have been selected for multiplication and more extensive trial.

Progress has been made in breeding varieties field-immune from the mosaic viruses A and X. This quality is already available in certain commercial varieties—e.g., Epicure, King Edward VII., Ninetyfold, and Craigs Defiance, and its mode of inheritance presents no unexpected problems. These varieties are all pollen sterile, but by utilising them as female parents in breeding for blight resistance it has been possible to combine the two qualities. Seedling selections resistant to blight and field-immune from viruses A and X are now undergoing comparative trial.

No variety has yet been found to be immune from leaf-roll disease, but some are much less susceptible than others. Imperia,

Shamrock, and Southesk appear to possess some degree of resistance, and they have been used as parents in the blight-resistance experiments with the object of combining in new varieties as much resistance as possible to leaf roll with resistance to blight.

THE WEST OF SCOTLAND AGRICULTURAL COLLEGE.

(a) ANIMAL HUSBANDRY DEPARTMENT.

Artificial Insemination.—During July some forty-three mares which had not settled to repeated natural service during the breeding season were inseminated by artificial means. Twenty-five of these mares had also failed to settle during 1941 season, but the specific cause of their sterile condition was not determined nor was any treatment undertaken. Sixty per cent of the mares showed subsequent œstrus and are unlikely to be in foal. The results with regard to the remainder will not be available till the 1943 foaling records are to hand.

Head Grit.—Analyses of blood and other tissues of lambs affected with this disease have revealed the presence of high concentrations of a photodynamic substance—phylloerythrin—which appears to be the immediate cause of the symptoms of the disease. The same substance has been isolated by South African workers from the organs of sheep suffering from a widespread disease in the Union known as ‘Geeldikkop.’ Certain points of similarity between Head Grit and Geeldikkop have been noted, and other criteria are being examined to determine whether these are one and the same disease.

Vinquish.—On three hill farms where the trials were conducted the sheep stock, grazing over strips of land on affected hefts manured with cobaltised basic slag, have remained free from symptoms of vinquish over a period of two years. Cases of the disease have appeared on adjoining untreated hefts, although the general incidence of the disease has been low in the south-west during the past three years. The observations are being continued.

(b) MILK UTILISATION DEPARTMENT.

The influence of mastitis on the quality of milk has continued to receive attention. The milk of a number of herds has been found consistently to be well below the presumptive solids-not-fat standard required by law. The separation of herds according to the degree of mastitis infection has still further emphasised the lowering of the milk quality due to disease. In one case the milk of a group of animals known to be giving milk of a poor quality

due to udder disorder was found to contain only 7.69 per cent of solids-not-fat. Such milk showed on superficial examination little indication of abnormality, and when mixed with the full herd supply depressed the chemical quality to a dangerous degree.

The Freezing Point Depression has been determined in a large number of these milks of poor quality. In no single case has genuine milk of low solids given an abnormal depression. Such a result is of the greatest importance to the dairy industry. While the Freezing Point Depression Test enjoys little or no legal recognition in this country its wider adoption and legal value are being recommended. Milk producers selling genuine milk of poor quality due to mastitis in the herd are in constant danger of prosecution. The full recognition of the Freezing Point and the application of the test to all milk samples suspected of adulteration are improvements to which no honest milk producer need take any objection.

Cheese.—On request the department carried out a full and exhaustive test on the cheese-making qualities of a new brand of commercial rennet.

Certain differences were observed with this new rennet. Initial coagulation of the milk seemed to proceed less quickly, but did not result in any delay in the time of curd cutting. The experimental curd was much more retentive of moisture in the initial stages of cheddaring, but lost this increase at the time of salting. A marked difference in the rate of curing was apparent when the cheese were submitted to a number of experienced cheese judges. In all cases the use of the new rennet resulted in a slower rate of curing in the early stages, but little or no difference was observed when cheese had undergone the full period of maturation. Cheese of first quality were made with the new rennet, and no cheese-maker need hesitate to use it.

Dairy Faults.—The advice of the department has been sought on a varied assortment of dairy troubles in all spheres of production and manufacture.

Inattention to the necessary detail in the technique required in the cleaning and sterilisation of the milking machine has resulted in the usual high bacterial counts in farm milk supplies. In one somewhat striking case a pronounced 'burnt flavour' appearing in a farm milk supply was found to originate in the milking machine. A well-known brand of chemical sterilising agent was in daily use on this farm, but it would seem that failure to clean the machine effectively prior to the use of the chlorine preparation resulted in failure of the agent to sterilise the milking units.

A new colour defect in white cheddar cheese of farm origin is engaging the attention of the department. The pigment-producing organism is a bacillus. The brown smudgy spots in the white cheese render the cheese of lower commercial quality, although the flavour of the product is in no way seriously affected.

The service of inexperienced war-time labour in the larger pasteurising dairies has resulted in a number of complaints regard-

ing the cleanliness of milk bottles. In one case the yellowish scum persisting on improperly sterilised milk bottles has been found to be a growth of a heat-resisting pigment-producing organism of the *sarcina* type.

THE HANNAH DAIRY RESEARCH INSTITUTE.

KIRKHILL, AYR.

Farm Self-sufficiency.—For some years work has been directed towards achieving complete self-sufficiency in regard to supplies of feeding-stuffs for the dairy herd. An account of this work has now been prepared and appears in the present volume of the 'Transactions.' In addition to utilising grass silage and to conserving surplus herbage as dried grass, attention has been directed to the growing of protein-rich green crops, particularly cereal mixtures. This work is being continued, and extended studies are also being made of the best conditions and treatment for the successful growth of beans, which form a valuable protein supplement for milking stock.

Further progress has been made in determining the value of synthetic non-protein nitrogen compounds, such as urea, as substitutes for protein in the production rations of milking cows, and it has been found that such compounds can successfully replace up to one-third of the protein—though at a slight loss in efficiency.

The Storage of Feeding-stuffs.—In view of the increased use of farm buildings and adapted premises for the storage of feeding-stuffs and of the consequently enhanced risk of deterioration, an extensive series of experiments has been undertaken to determine the limiting humidity and moisture contents necessary to avoid mould growth and other undesirable changes. Progress has been made in defining the optimum conditions for storage for a large number of cereal and oilseed products, though the investigations have meantime been limited to the prevention of moulding as distinct from 'heating'.

The Diseases of Dairy Cattle.—In co-operation with the Agricultural Research Council investigations have been continued into the methods of diagnosis, control, and treatment of contagious bovine mastitis. Improvements have been made in a simple method of laboratory diagnosis which had been previously devised at the Institute, but further work will be required before the test can replace the more cumbersome plating methods. Attempts to control the spread of the disease by the adoption of hygienic measures have been continued in some sixty herds, with variable success. Reasonably satisfactory results have been obtained in a number of herds by the use of sulphonamide and of acriflavine as curative agents: the value of various other substances is now being studied. As regards other cattle diseases, a large number of routine tests

for the diagnosis of contagious abortion has been carried out for individual herd-owners and veterinary surgeons. The Institute is also co-operating in a study of the possible methods of treatment of white scour in calves, which is a cause of exceptionally heavy loss in the South-West of Scotland.

The Hygienic Quality and Methods of Storage of Milk Powders.—

The increased use of reconstituted milk powders as a substitute for liquid milk has directed increasing attention to the problems involved in the manufacture and storage of such powders. Two aspects of the subject have been specially studied during the past year—namely, the hygienic quality of the powders and their keeping properties. As regards hygienic quality, extensive tests have been made to determine the extent and types of bacteria which survive processing, the samples examined being derived from a wide variety of plants and including both roller and spray dried milks. More recently this study has been extended to include products such as dried whey and dried buttermilk. As regards the keeping property of milk powders, the major problem is the prevention of ‘tallowiness,’ an unpleasant form of fat deterioration. Notable success has been achieved, both on a laboratory and a commercial scale, by the use of inert gas packing. Further work is now in progress to determine the value of blocking by high compression, and of the addition of small quantities of so-called anti-oxidants.

MACAULAY INSTITUTE FOR SOIL RESEARCH.

CRAIGIEBUCKLER, ABERDEEN.

There were no major changes in the programme carried out, attention being mainly directed as before to advisory work and problems of immediate practical importance. Close co-operation with certain other institutions has been continued. The following is a summary of the progress in the various departments:—

Advisory Work.—As indicated in previous years’ reports, the Institute undertakes the testing of soils on behalf of farmers in the North of Scotland, and advice on liming and manuring is given free of charge. During the year full advisory analyses have been carried out on over 3600 samples and partial analyses on additional samples. Most of these have been on behalf of farmers and market gardeners, but a considerable amount of work had also been done for the Air Ministry, the Forestry Commission, and other public bodies. The results have again shown that lime deficiency is widespread in both arable rotation land and grassland. Phosphate deficiency is much more pronounced in old grassland than in rotation land, but even in the latter there is widespread need for phosphate. Under present conditions the supplies of phosphate available are likely to be inadequate to meet the real needs of the soils,

but there are in Scotland abundant reserves of limestone and calcareous sand which, if developed, would be of enormous benefit in increasing the productivity of the land.

General Soil Fertility Investigations.—Experimental work on the effects of lime and phosphate has been continued with particular reference to the value of different forms and sources of phosphatic manures and to the problem of phosphate fixation in the soil. In liming experiment areas it has been found that the lime is continuing to have a very beneficial effect in the fourth season after its application; with hay, for instance, yield increases of up to 35 per cent have been obtained. The residual effects on pasture of experimental dressings of phosphate which were applied four years ago appear to be less marked than those of lime. The time of application of superphosphate, the conditioning of fertiliser mixtures, the manurial value of the potash in a crushed biotiteschist, and various other problems have also been studied.

Soil Classification and Surveys.—An area of eighty-four square miles has been surveyed in Northern Aberdeenshire, in addition to small areas in Ross and Cromarty, Sutherland, and Inverness, where investigations on pining are in progress. In Argyllshire the survey of Ardgartan Forest has been completed, and work carried out in Eastern Kincardineshire is ready for publication. Mineralogical studies on the glacial drifts and soils have been continued.

Soil Organic Matter and Peat.—On account of the numerous inquiries received regarding peat, the survey of the peat resources of Scotland has been resumed in collaboration with the Geological Survey. Investigations on composts and on the use of peat fortified with artificial manures have been continued.

Spectrographic and X-ray Work.—The spectrographic work has been further developed and the methods improved. Large numbers of samples (over 7000) have been examined by the Flame Emission method in connection with advisory, survey, and peat problems. The cathode layer arc method has been used in the determination of various trace constituents in soils, soil parent materials, and plant materials. X-ray crystallographic work has also been undertaken with a view to applying this method to the study of soil colloids.

Soil Drainage and other Investigations.—The study of the drainage from the Craibstone lysimeters has been continued, and investigations have also been carried out on cobalt manuring and pining in stock, differences in feeding value for stock of the produce from good and poor feeding farms, and soil conditions in relation to tree growth. The survey of Scottish limestones, undertaken in collaboration with the Geological Survey, has been practically completed.

MILK RECORDS.

FORTIETH YEAR—RECORDS OF 37,939 COWS.

By JAMES A. PATERSON, Secretary-Superintendent,
The Scottish Milk Records Association.

SYSTEMATIC milk recording in Scotland was continued in 1942 under the direction of the Scottish Milk Records Association on the same lines as in previous years, notwithstanding the fact that the Exchequer grant to meet administration cost was discontinued as from 31st March 1940. The Association were again fortunate in obtaining a grant at the rate of £500 per annum from the Ayrshire Cattle Herd Book Society, and £200 from the British Friesian Cattle Society; the balance of the total cost to the Association to operate the Scheme being met by the members of the Milk Recording Societies.

The Association in 1942 consisted of the following members of Milk Recording Societies:—

Name and Address.	Body Represented.
Mr E. A. Bell, 2 Miller Road, Ayr . . .	Central and South Ayrshire Milk Recording Society (6 Circuits).
Mr John Lockhart, Stair House, Mauchline . .	
Mr William Wallace, Lyonstone, Maybole . .	
Mr R. H. U. Stevenson, Corseclays, Ballantrae . . .	
Mr M. Semple, Sandhill, Drongan . . .	Central Ayrshire No. 2 Milk Recording Society.
Mr K. N. Russell, Auchincruive, by Ayr . .	
Mr George Templeton, Carnell Home Farm, Hurford . . .	
Mr W. Alexander, Solsgirth, Dollar . . .	
Mr J. C. Lohoar, Whitlawburn, Cambuslang .	Central Scotland Milk Recording Society (5 Circuits).
Mr T. C. Stewart, Southfield, Kirkmuirhill .	
Mr Thos. Johnstone, Standalane, Falkirk . .	
Mr M. Bowie, Balmuildy, Maryhill . . .	
Mr W. M'Lachlan, East Crookedstone, Quarter .	Dumbartonshire Milk Recording Society.
Mr Robert Watt, Milligs Farm, Helensburgh .	
Mr M. Sloan, Hunterhouse, Lochmaben . .	Dumfriesshire Milk Recording Society (3 Circuits).
Mr J. Stevenson, Muiryhill, Durisdeer . .	
Mr John Johnstone, Millantae, Lockerbie . .	
Mr David S. Clark, Bellshiel, Duns . . .	
	East Lothian and Border Milk Recording Society.

Name and Address.	Body Represented.
Mr G. W. Lambie, Nether Pratis, Leven .	Fife Milk Recording Society.
Mr A. Munro, Dell of Inshes, Inverness .	Highland Milk Recording Society.
Mr John T. Kirkwood, B.Sc., N.D.A., Scorrieholm, Lesmahagow	Lesmahagow Milk Recording Society.
Mr John Wallace, Whitehills, Sorbie . .	Machars Milk Recording Society (2 Circuits).
Mr Robert Laird, Lawthorn, Irvine . .	North Ayrshire (John Speir) Milk Recording Society (3 Circuits).
Mr J. M. Matthew, Girthill, Saltcoats .	
Mr Thomas Murdoch, West Tannacrieff, Kilmarnock	
Mr R. C. May, 77 Crown Street, Aberdeen .	North of Scotland Milk Recording Society (3 Circuits).
Mr Robert Howie, Flatterton, Greenock .	Renfrew and Bute Milk Recording Society (2 Circuits).
Mr John Raeside, Hattrick, Kilmalcolm .	
Mr John Forster, Mains of Larg, New Luce	Rhins of Galloway Milk Recording Society (3 Circuits).
Mr J. M. Gilmour, Chapelton, Borge	Stewartry Milk Recording Society (4 Circuits).
Mr J. G. Baird, Kirkchrist, Kirkcudbright .	
Mr George Barbour, Auchengibbert, Crocketford	
Mr G. Clark, Newmains, Prestonmill .	
Col. W. T. R. Houldsworth, Kirkbride, Maybole	The Ayrshire Cattle Herd - Book Society of Great Britain and Ireland.
Mr A. W. Montgomerie, Westburn, Cam- buslang	
Mr James Howie, Muirside, Dumfries . .	
Mr A. B. Fowler, Ph.D., B.Sc., Kirkhill, Ayr	
Mr William Montgomery, North Milton, Kirkcudbright	The Highland and Agricultural Society of Scotland.
Mr James Kilpatrick, Craigie Mains, Kil- marnock	
Capt. Ian S. Robertson, Linkwood, Elgin .	The British Friesian Cattle Society.
Mr James Kilpatrick, Craigie Mains, Kil- marnock	
Mr A. M'Intyre, Dunallan, Rothesay . .	The West of Scotland Agricultural College.
Mr James Dunlop, Midland, Prestwick .	
Mr J. S. Stevenson, Balig, Ballantrae . .	The Edinburgh and East of Scotland College of Agriculture.
Principal W. G. R. Paterson, 6 Blythswood Square, Glasgow	
Dr A. M. Smith, 13 George Square, Edin- burgh	The North of Scotland College of Agri- culture.
Dr A. Cunningham, 13 George Square, Edin- burgh	
Dr J. F. Tocher, 41½ Union Street, Aber- deen	
Professor J. Hendrick, Marischal College, Aberdeen	
Mr Arthur R. Wannop, B.Sc., B.Eng., 41½ Union Street, Aberdeen	

Name and Address.	Body Represented.
Mr John Forster, Mains of Larg, New Luce .	Animal Diseases Research Association.
Mr W. Cassels Jack, Glenpark, Braxfield Road, Lanark	
Dr Norman C. Wright, M.A., Ph.D., Kirkhill, Ayr	The Hannah Dairy Research Institute.
Dr A. B. Fowler, Ph.D., B.Sc., Kirkhill, Ayr	
Sir Hugh Shaw-Stewart, Bt., K.C.B., Ardgowan, Inverkip	Co-opted Members.
Lord Rowallan, Rowallan, Kilmarnock .	
Mr John Speir, 81 Hope Street, Glasgow .	
Mr Alan Barr, Hobsland, Monkton .	
Dr Chalmers Watson, Fenton Barns, Drem .	

Chairman—Col. W. T. R. Houldsworth.

The following were the principal members of the staff :—

Superintendent-Secretary—Mr James A. Paterson.

Assistant Superintendent—Mr Percy H. Hart.

SCHEME OF OFFICIAL MILK RECORDS.

ADMINISTRATION.

In 1942, as in previous years, the scheme of official milk records was administered by the Association through local milk recording societies. During the latter part of 1941 and the earlier months of 1942 every effort was made to obtain new members for local societies throughout the various dairying districts of Scotland, and a number of new members were enrolled. For various reasons, such as members disposing of their dairy herds or removing from their farms, &c., resignations were somewhat greater than usual.

All the local societies which operated in 1941, with the exception of two, continued in 1942. The number of recorders' circuits in 1942 was 37, 2 less than in the previous year. The number of herds officially tested was 805, and the number of cows officially tested 37,939, a decrease of 11 herds and 1595 cows from the previous year. The following is a list of the milk recording societies

which operated in 1942, with the name and address of the Secretary of each society :—

Name of the Society.	Secretary.
Central and South Ayrshire (6 Circuits)	Mr E. A. Bell, M.A., B.Sc., 2 Miller Road, Ayr.
Central Ayrshire No. 2 .	Mr James Caldwell, Moorfield, Kilmarnock.
Central Scotland (5 Circuits)	Mr Arthur Gilmour, C.A., 23 Silvergrove Street, Glasgow.
Dumbartonshire . . .	Mr Robert Bilsland, Quay Place, Dumbarton.
Dumfriesshire (3 Circuits)	Messrs Henderson & Mackay, Solicitors, Lockerbie.
East Lothian and Border .	Messrs Inglis, Orr, & Bruce, 19a Hill Street, Edinburgh.
Fife	Mr F. Dow, Commercial Bank, Thornton, Fife.
Highland	Mr J. M. Hunter, Queensgate, Inverness.
Leismahagow	Mr Thomas MacKail, British Linen Bank, Leismahagow.
Machars (2 Circuits) . .	Mr William Christison, Barglass, Kirkcinner.
North Ayrshire (John Speir) (3 Circuits)	Mr George F. F. Smith, Union Bank, Kilmarnock.
North of Scotland (3 Circuits)	Mr Robert C. May, Advocate, 77 Crown Street, Aberdeen.
Renfrew and Bute (2 Circuits)	Mr Thomas Hunter, Solicitor, 35 High Street, Paisley.
Rhins of Galloway (3 Circuits)	Mr W. Brown Moir, 8 Bridge Street, Stranraer.
Stewartry of Kirkcudbright (4 Circuits)	Mr Patrick Gifford, Solicitor, Castle Douglas.

SEASON 1942.

The following table shows for each society or circuit the number of herds, the number of cows tested, the average interval between tests, and the duration of the recording season :—

Name of the Society or Circuit.	No. of Herds.	No. of Cows Tested.	Average Interval between Tests, in Days.	Duration of Recording Season, in Weeks.
Central and South Ayrshire—				
1. Ayr and Troon	23	883	28	52
2. Coylton and Ochiltree	21	758	28	52
3. Cumnock	22	761	28	52
4. Girvan	19	1011	25	52
5. Kilmarnock	18	752	24	52
6. Maybole	22	972	28	52
7. Central Ayrshire No. 2	23	942	28	52
Central Scotland—				
8. Carlisle and District	19	771	25	52
9. Dunblane and District	23	879	28	52
10. Falkirk and Linlithgow	20	868	26	52
11. Strathaven and District	20	888	26	52
12. Strathendrick	21	1115	28	52
13. Dumbartonshire	22	817	28	52
Dumfriesshire—				
14. Dumfries—No. 1	21	910	28	52
15. „ No. 2	22	1010	28	52
16. „ No. 3	21	966	28	52
17. East Lothian and Border	24	1204	28	52
18. Fife	27	1203	28	52
19. Highland	22	696	28	52
20. Lesmahagow	25	942	28	52
21. Machars—No. I.	19	1031	25	52
22. „ No. II.	20	901	26	52
North Ayrshire (John Speir)—				
23. Fenwick	21	1009	28	52
24. 'John Speir'	24	909	28	52
25. Stewarston and Montgomerie	20	810	28	52
North of Scotland—				
26. Aberdeen, Kincardine and Angus	23	1287	28	52
27. Aberdeen, Moray and Banff	25	1521	28	52
28. Aberdeenshire	25	1195	28	52
Renfrew and Bute—				
29. Bute and Kintyre	19	637	25	52
30. Paisley and District	21	824	28	52
Rhins of Galloway—				
31. Kirkcolum and District	19	1207	28	52
32. Kirkmaiden and District	16	1281	28	52
33. Luce Valley	21	1337	28	52
Stewartry of Kirkcudbright—				
34. Dalbeattie and New Abbey	26	1490	28	52
35. Castle Douglas and District	25	1438	28	52
36. Kirkcudbright and District	22	1304	28	52
37. Borgue, Twynholm & Gatehouse	24	1410	28	52
Total No.	805	37,939	...	...

DEFINITIONS.

The milk records compiled by the Association are records of the estimated quantity of milk produced by each cow in a separate lactation, and of the estimated percentage of milk fat contained in the milk. For convenience, a gallon of milk is reckoned as 10 lb. A gallon of milk of average quality weighs almost exactly $10\frac{1}{2}$ lb. The following further particulars concerning each record were also given wherever possible :—

- Name of cow, byre number, and herd-book number.
- Sire of cow and herd-book number of sire.
- Dam of cow and herd-book number of dam.
- Date of birth.
- Date of calving preceding opening of record.
- Number of weeks in milk.
- Date of calving after record closed.

The following particulars of the preceding record were appended to each record, where available :—

- Date of calving preceding opening of record.
- Quantity of milk in gallons.
- Percentage of fat in milk.
- Number of weeks in milk.

The milk yields were estimated in respect of quantity and milk-fat percentage from the results of systematic periodic tests by trained recorders approved by the Association. The recorders visited the farms for this purpose at intervals varying from twenty-one to twenty-eight days, and each day of visit was regarded as the middle day of the period covered by the test. Milk records estimated in this way approximate closely to the actual milk yields.

METHOD OF RECORDING—OFFICIAL RECORDS.

A distinctive feature of milk recording in Scotland in 1942, as in previous years, was that the official records were entirely the work of trained official recorders. Recorders had previously to undergo a special course of training in milk recording at the West of Scotland Agricultural College or other approved College of Agriculture. Only candidates of good character and good general education were selected to attend these courses ; and all recorders before appointment were approved by the Executive Committee of the Association.

All dairy farmers taking advantage of the Association's scheme were arranged into Local Milk Recording Societies employing one or more recorders, the Executive Committee having power to transfer members from one local society to another, in order to find accommodation for new applicants, and at the same time avoid overlapping of recorder's circuits. Each local society applying to the Association for licence to conduct milk recording under the Association's scheme signed the form containing the Associa-

tion's rules and regulations, and agreed to conform to these rules. The local society selected and appointed their recorder or recorders from the list of approved recorders obtained from the Association. Apparatus, chemicals, sheets, and books were selected and arranged for by the Association, all byre sheets and record books used by the recorders being supplied free of charge. Thus uniformity of method was, as far as possible, assured.

The official recorder visited each herd at intervals of not more than twenty-eight days. He, or she, arrived at the farm in the afternoon, usually by means of a small pony and trap provided by the local society for the purpose, or by motor-car, and was accommodated at the farm overnight. All cows giving milk in each herd, as far as was possible, were included in the records. Each cow was clearly distinguished in the byre by a stall number on the wall, immediately in front of and above the level of the cow, and registered animals were also indelibly tattooed on the ears with distinctive registered tattoo markings. The cows were milked in the same rotation, evening and morning, on the occasion of the recorder's visit. The recorder weighed and sampled the milk of each cow in the evening, noting the time at which each cow was milked, and entered the results in the corresponding columns in the byre sheet, taking up a position in the byre as near to the milkers as possible, so as to have them in full view, and, as far as practicable, receiving the milk direct from the milker at the cow's side. He again weighed and sampled the milk of each cow in a similar manner in the morning, and entered the results in the byre sheets. He then tested the mixed evening and morning proportionate sample for each cow by the Gerber method for percentage of milk fat. He entered in the byre sheet any unusual conditions likely to affect the milk yields. The recorder was required to see that all milk samples and byre sheets were securely locked up overnight or during his absence. From the daily results the recorder calculated and completed the byre sheets, multiplying the yields by the exact number of days which had elapsed since the last test, but so calculating throughout that each day of the visit was regarded as the middle day of the period covered by the test. Special ready-reckoners were used to facilitate calculating and to ensure greater accuracy.

The byre sheets were written out in duplicate. The principal copies were posted at regular intervals to the office of the Association, and the second copies left with the respective members. The recorder transferred the results from the extended byre sheets to the milk record book for the herd indelibly in ink, each cow being assigned a separate page, at the top of which full particulars of the cow were entered, including the indelible tattoo marks on the animal.

Visits of inspection were made to each recorder and to the members of local societies at the different farms periodically throughout the year by members of the Association's staff, and reports thereon submitted to the Executive Committee. The

Executive Committee reserved the right to withdraw approval of any recorder at any time, or to limit the period of service of any recorder with any particular society. Members of local societies refusing to observe any of the rules of the Association, or deemed to be guilty of conduct injurious to the true interests of milk recording, were liable to be temporarily or permanently suspended.

During the year a number of surprise tests were made by the Association's staff in order to check the recorders' work. Re-tests of the milk samples already tested by the recorder were also carried out; for this purpose recorders were instructed to retain the milk samples each morning till ten o'clock.

All records were closed at the end of December, the current lactations being carried forward to the new books of the following year. Finally, summary sheets were written out in duplicate showing the total milk yield for each cow for the lactation or part lactation, with full particulars of the cow, dates of calving, &c. The principal copy of the summary sheet was posted to the Association's office with the record book, and the second copy left with the owner of the herd.

All record books and summary sheets were carefully revised, corrected in detail, and initialled in the Association's office during the next few months, the record books being returned later to the respective members, and the summary sheets retained and bound for future reference.

The milk records were next classified into three groups for cows and heifers respectively as undernoted. Experience has confirmed the view that the most useful comparison is obtained by reckoning the yields in terms of pure butter fat. Such a comparison takes into consideration both the quantity and quality of the milk.

Cows with a milk record equivalent to not less than 280 lb. of butter fat, and heifers with a milk record equivalent to not less than 224 lb. of butter fat, were grouped into Class I. Cows and heifers with milk records of less than two-thirds of these amounts—viz., 186 and 149 lb. of butter fat respectively—were grouped into Class III.

The following short table shows the corresponding values of these yields in fairly good milk of 3·5 per cent milk fat:—

Class.	Yield of Butter Fat. (Lb.)	Corresponding Yield in Milk of 3·5 per cent Fat. (Gallons.)
Cows in Class I. . .	Not less than 280 . .	800
Heifers in Class I. . .	Not less than 224 . .	640
Cows in Class III. . .	Less than 186 . .	531
Heifers in Class III. . .	Less than 149 . .	426

All cows and heifers with milk yields falling between these limits would come into Class II. Such animals naturally claim less attention than the good milkers or the obviously unprofitable

animals. It should be noted, however, that Class II. would include a certain number of unclassifiable yields, as there were a number of cases where, from various causes, the results of a whole normal lactation could not be obtained.

It should be noted that while the above standards for classification of milk yields are the same as for 1934 onwards, they are higher than those formerly adopted, in the proportion of 280 lb. of butter fat for a Class I. cow to the former standard of 250 lb., the other standards bearing the same relation as formerly to the cow Class I. standard. This decision of the Executive Committee brought the Class I. standard for cows and heifers respectively into line with those adopted since 1924 for the Association's Annual Register of High-yielding Cows. This subject was dealt with more fully in the 1934 report under "General Review."

It should always be kept in mind when making a comparison of cows in different herds or in different districts that the different methods of dairying practised have a considerable influence on the milk yields, and that therefore milk yields alone do not necessarily indicate the true relative inherent or hereditary milking qualities of the animal. But the authenticated milk records compiled by the Association are of inestimable value to breeders and owners of dairy cows if properly interpreted.

REVIEW—OFFICIAL MILK RECORDS.

Recording was carried on in 1942 by 37 local societies or circuits, comprising 805 members. The number of cows tested in 1942 was 37,939, compared with 39,534 in 1941.

Forty-five women recorders were employed in 1942, and 12 men recorders. The Committee are again indebted to the West of Scotland Agricultural College for giving special courses of instruction for milk recorders to meet the Association's requirements. Two special courses were required in 1942, one in March, and one in November. Twenty-two selected candidates attended, and 17 obtained the certificate.

The Executive Committee purchased the supplies of milk-testing apparatus, sulphuric acid, and amylic alcohol for local societies, as in previous years.

PROSPECTS FOR MILK RECORDING.

The introduction of the animal feeding-stuffs rationing scheme and the national drive for increased milk production makes it more than ever essential that all dairy farmers should practise systematic milk recording. By milk recording the dairy farmer is able to progress by three main avenues :—

1. Through weeding out obviously unprofitable and unthrifty cows.
2. Economic feeding and more effective management generally.
3. Skilful breeding.

The first two of these are of particular importance at all times, but even more so in war-time. Special difficulties to be surmounted are shortage and high cost of suitable cattle feeding-stuffs and of efficient dairy farm labour. Skilful breeding for milk production in the light of the milk records obtained is no less important in a well-directed effort to increase production of good milking cows in a herd.

Up to the date of preparation of this article the number of new members obtained for 1943 is 54, the number of recorders' circuits has been reduced by 1, but the total number of herds presently being recorded is 817, as compared with 805 in 1942. While the Association are doing their utmost to accommodate all herd owners wishful to commence milk recording, they have been unable to include under this scheme quite a number owing to the difficulties being experienced in obtaining new apparatus for the formation of new circuits. They are very hopeful, however, that some arrangement will be made through the Department of Agriculture for Scotland whereby priority will be given for this equipment, and they hope at a very early date to be able to make adequate arrangements for the formation of new circuits in various districts, so that all herd owners who are wishful to have their herds milk recorded will be accommodated.

In regard to milk recorders the position has been somewhat eased. Through the co-operation of the Department of Agriculture, arrangements have been made to train certain selected members of the Women's Land Army. These members, after they have completed their course and obtained the certificate, will continue to be employed on Land Army work until their services are required for milk recording. It is hoped by this method to have always a reserve of qualified milk recorders, so that there will be no question of stoppages in cases where recorders may have to discontinue work for a period through illness. In conclusion, it is hoped that the Association will be able to announce fairly soon that assistance to meet the costs involved will be available as it presently is in England.

ANALYSES FOR MEMBERS DURING 1942.

By Dr J. F. TOCHER, Aberdeen, Analyst to the Society.

THE following is a brief account of the results of analyses of samples sent in by members during 1942 :—

FERTILISERS.

The fertilisers examined during the season included nine compound manures, two superphosphates, and two phosphatic manures. The following table (Table I.) gives the results of analysis of the compound fertilisers :—

TABLE I.

	Nitrogen.	Soluble phosphoric acid.	Insoluble phosphoric acid.	Potash.
Potato manure	5.46	9.16	1.00	7.11
” ”	5.15	9.69	1.28	6.17
” ”	7.08	6.67	1.30	8.69
” ”	5.98	7.94	0.93	9.18
Manure	3.62	7.37	2.04	5.72
Grain manure	4.52	11.57	2.32	..
” ”	5.18	11.83	1.79	..
” ”	4.92	12.41	1.27	..
Turnip manure	4.88	11.20	1.96	..

On account of the restriction in the use of potash, only mixtures intended for special crops, such as the potato crop, contained this ingredient. Potash was found in five of the mixed fertilisers, the proportion ranging from 5.7 to 9.2 per cent. The average proportion of potash in these fertilisers was 7.4 per cent. Another characteristic of mixed fertilisers under the present abnormal conditions is the low proportion of insoluble phosphoric acid. This is due to the restriction on the use of mineral phosphate, the supplies being reserved entirely for the production of superphosphate. The small amounts of insoluble phosphoric acid found in the mixed fertilisers, ranging from just under 1 per cent (0.93 per cent) to slightly over 2 per cent (2.32 per cent), are derived from the superphosphates used in the mixtures. Although the phosphoric acid found in superphosphate is mainly soluble, that is, it dissolves in water, there is always a small residue of insoluble phosphoric acid. For example, in the samples of superphosphate examined for insoluble phosphoric acid the proportions found were 2.3 and 3.5 per cent.

Several samples of ground limestone and waste lime were analysed during the year. The highest proportion of calcium

carbonate (carbonate of lime) found was 92.7 per cent, while the lowest was 73 per cent. In the latter case a fairly high proportion of magnesia, 8.6 per cent, equivalent to 18 per cent of magnesium carbonate, was found. This limestone was thus of the nature of a magnesian limestone.

The samples of waste lime analysed contained 50.9 and 59.7 per cent of calcium carbonate, but contained fairly high proportions of moisture. When calculated on a moisture-free basis the corresponding proportions were 89.4 and 97.4 per cent.

FEEDING-STUFFS.

The feeding-stuffs analysed included several of the mixtures available for cattle, pigs, and poultry under war conditions. The results of analysis showed the composition of these to be satisfactory. In a number of cases particular feeds were suspected of having had injurious effects on stock, and the feeds were further examined for the presence of poisonous substances. In no case was any deleterious substance found in the feed. Samples of by-products from oats were analysed, the fibre content of these ranging from 21 to 29 per cent. Other materials which were found to contain a high proportion of fibre were by-products from flax. In one sample the proportion was 22 per cent, and in another it amounted to nearly 25 per cent. Samples of yellow turnips were analysed to determine whether there was any appreciable difference in feeding value between the top and bottom halves of the root. As a result of the analyses no significant difference was found.

A sample of rowan berries was analysed for a member who wished to ascertain whether they had any value as part of a ration for poultry. As received, the berries contained 26.5 per cent of dry matter, mainly carbohydrates. Apart from the carbohydrate content, the feeding value of the berries was low. Rowan berries are not of value as a feeding-stuff, but have antiscorbutic properties due to the presence of vitamin C. The berries have astringent and diuretic properties.

Samples of silage analysed contained rather higher proportions of moisture than usual. One sample was of very good quality, containing, in spite of the high moisture content, as much as 3.3 per cent of albuminoids and 8.3 per cent of carbohydrates. The composition of another sample, made from third year's grass, was compared with that of hay from the same material. When due allowance was made for the moisture content of each it was found that the sample of hay contained a rather higher proportion of albuminoids. There was practically no difference in the carbohydrate content of the two samples.

A sample of linseed oil, which was said to have caused excessive scouring when administered to horses, was sent for analysis. This was found to be genuine linseed oil. It was pointed out to the member that linseed oil has a decidedly laxative effect and must be used with care.

The following table (Table II.) gives the results of analysis of the various feeding-stuffs received:—

TABLE II.

	Oil.	Albu- minoids.	Phos. acid.			
Meat and bone meal . . .	13.76	51.38	9.83			
Meat and bone meal . . .	13.51	50.44	10.32			
				Soluble carbo- hydrates.	Fibre.	Ash. Moisture.
Calf meal	3.43	19.53	..	5.67	..	..
Pig meal	3.52	18.56	..	7.90	..	..
Mixture	4.27	13.81	..	8.28	..	..
Feeding nuts	5.43	19.44	..	6.33	..	..
Layers' mash (No. 1) . .	4.67	23.06	..	6.76	..	..
Layers' mash	4.35	17.50	..	8.30	..	..
Layers' mash	3.82	15.32	..	8.06	..	..
Growers' mash	4.19	16.60	..	6.67	..	..
Poultry meal . . . . .	..	..	..	12.60	..	..
By-product from flax . .	3.45	9.37	30.28	24.75	19.72	12.43
Flax chaff	14.09	14.56	30.76	21.97	7.83	10.79
Rowan berries	0.48	1.00	22.77	1.68	0.58	73.49
Palm kernel meal	6.43	19.19	..	10.20	..	..
Palm kernel meal	6.49	16.87	..	9.00	..	..
Hay	1.73	9.25	42.86	26.33	6.10	13.73
Silage	0.59	1.59	8.98	6.33	1.00	81.51
Silage	0.81	3.33	8.25	4.47	1.49	81.65
Turnips	0.02	1.39	5.14	0.72	0.68	92.05
Turnips	0.02	1.31	5.33	0.69	0.70	91.95
Turnips	0.04	0.83	3.53	0.94	0.64	94.02
Turnips	0.03	0.89	3.29	0.85	0.69	94.25
Oatmeal . . . . .	..	..	..	..	..	9.78
Extra fine oatmeal . . .	..	..	..	..	..	11.04
Oat feed . . . . .	..	..	..	29.23	..	..
Meal sids . . . . .	..	..	..	27.70	..	..
Corn dust . . . . .	..	..	..	21.02	..	..

I should like to draw attention to the Feeding-stuffs (Maximum Prices) Order of 20th August 1942 (Statutory Rules and Orders, No. 1669), which contains, in the schedules, a list of feeding-stuffs and their basic prices. The Order contains twelve paragraphs of definitions which should prove very useful to purchasers.

I have not yet been able to obtain any substance which would be injurious or cause death to animals in mature bracken. Mature bracken has been fed by itself, and extracts of bracken, using various solvents, have also been fed to test the effect of bracken on animal life. Contrary to expectation, the dried extract had no visible effect on young animals. Results of feeding experiments on small animals have been entirely negative in character. I have arranged for a series of experiments to be conducted on young bracken in the spring. I hope to arrange to feed mixed bracken silage to young bullocks. In the meantime I cannot say I have found any poisonous substance in bracken which would cause illness or death to live stock. My investigation, however, is far from complete. It is quite clear that bracken is not an attractive feeding-stuff to live stock, but it cannot be said, without further experiments, whether it can be utilised as part of a ration. It is, however, being used in foreign countries. Bracken has got a very bad name among

owners of live stock. It has been a disappointment to me not to be able to find, in mature bracken, a poisonous substance injurious to live stock, but I am not going to say there is not such a substance.

MILKS.

Of the samples of milk analysed, two were found to be below the presumptive limit of 3 per cent in milk fat, while one was below the corresponding presumptive limit of 8·5 per cent in solids-not-fat. One sample was very low in both constituents, containing only 1·9 per cent of fat and 5·1 per cent of solids-not-fat. This proportion of solids-not-fat corresponds to the addition of water to a milk containing 8·5 per cent of non-fatty solids to such an extent as to give a mixture containing about 40 per cent of added water.

The following table (Table III.) gives the results of analysis of the samples received. In five cases an examination for fat percentage only was requested.

TABLE III.

No.	Fat, per cent.	Solids-not-fat, per cent.	No.	Fat, per cent.	Solids-not-fat, per cent.
1	3·52	8·37	8	1·90	5·13
2	3·80	8·60	9	4·20	..
3	3·00	8·66	10	2·65	..
4	3·20	8·74	11	4·15	..
5	2·97	8·68	12	4·15	..
6	3·80	8·21	13	4·10	..
7	3·30	9·54			

I wish to remind members that a Scottish Interdepartmental Committee, after hearing the evidence of many witnesses and getting the opinions of experts, recommended in 1922 that there should be legal standards for butter fat of 3 per cent and for solids-not-fat of 8·5 per cent. No action has yet been taken by the Government to institute standards instead of the present presumptive limits. But at present, to use a classic phrase, "the time is out of joint."

In a small volume I have prepared for publication I deal with the present presumptive limits and their legal bearing on milk sellers. I also deal with pasteurisation, milk marketing, and legal prosecutions. The results of research on milk from the physiological, bacteriological, and other standpoints get due notice. The final point I discuss is the proposal to get Parliament to create standards for butter fat and solids-not-fat. I think it appropriate to refer to the exceptional character of the present Milk Regulations. The exceptional character of the law is that the retail seller of deficient milk—that is, milk which has been found to contain less than 3 per cent butter fat and/or 8·5 per cent solids-not-fat—if charged, appears in Court guilty of a criminal offence. He is left to prove, if he can, his innocence of the charge. Often also the seller is quite

unaware that he has committed an offence. The offence has been described by legal authorities as quasi-criminal, but this term requires explanation and interpretation for those of us who are not legal practitioners or legal experts. May I venture, as a deeply interested amateur in constant touch with milk problems, to refer to a well-known principle in Criminal Law, usually quoted as 'Mens rea,' the meaning of the complete Latin phrase of which is that "the act does not constitute the performer of it a criminal unless the mind is also criminal." A heavy burden is thus imposed on the Court judges when cases of this kind come before them.

WATERS.

Of the samples of water analysed, ten were found to be of satisfactory quality for ordinary domestic purposes. One sample was reported as being of doubtful quality, while another was found to be of unsatisfactory organic purity. Two samples, which were otherwise satisfactory, were found to contain dissolved lead to the extent of 1 part and 2.4 parts per million, and on that account the water could not be recommended for domestic use. One sample which was received for analysis and advice as to its suitability for watering stock was found to be a sample of sewage quite unsuitable for the purpose for which it was intended.

POISONS.

A fairly large number of examinations of feeding-stuffs and of stomach contents was made in attempts to trace the cause of illness or death of various kinds of stock. A sample of meal mixture was found to contain arsenic to the extent of 0.5 per cent, and this poison was also found in the stomach of the animal receiving the meal in sufficient amount to be the cause of death.

From a sample of linseed cake, 0.046 per cent of hydrocyanic acid (prussic acid) was obtained on analysis. Very minute proportions of this substance are always present in linseed as a normal constituent with no danger to health, but a proportion as high as 0.046 per cent is above the average. The member was advised that the usual course in feeding this cake was to make it into a mash with boiling water and then leave for two or three hours before using. If this were done there would be no possibility of the poisonous substance being present.

In all other cases the results of the search for poisons were entirely negative.

SCOTTISH RED CROSS AGRICULTURE FUND.

THIRD ANNUAL REPORT.

REPORT ON ACTIVITIES OF THE COMMITTEE OF THE FUND
DURING THE YEAR 17TH APRIL 1942 TO 16TH APRIL 1943,
SUBMITTED TO, AND ADOPTED BY, THE GENERAL COMMITTEE
AT A MEETING HELD ON 26TH MAY 1943.

THE Committee of the Fund has now completed its third year of operations. The total amount of contributions received during the period was £151,817, 1s. 6d. To this was added a sum of £132, 2s. 1d., being interest accruing on sums placed on Deposit Receipt for short periods. This gave a total for the year of **£151,949, 3s. 7d.**

Adding this amount to the sums raised in the first and second years—£115,876, 14s. 2d. in 1940-41 and £109,839, 6s. 10d. in 1941-42—gives a grand total of **£377,665, 4s. 7d.** raised by the Committee during its three years of activity.

As in the preceding years, the money raised during the third year was handed over, at various times throughout the year, to the Scottish Branch, British Red Cross Society, and the St Andrew's Ambulance Association. The total allocated to the former body was £144,023, 1s. 7d., and to the latter £7926, 2s.—in all, £151,949, 3s. 7d. The allocation, which was made by the Allocation Committee, varied from 90 to 95 per cent to the Red Cross and from 10 to 5 per cent to the St Andrew's. The proportion allocated to the Red Cross was increased in view of the great demands being made upon that body and the fact that it was urgently in need of money to meet its rapidly increasing expenditure. The Committee, however, decided that should circumstances arise in the future which showed that the St Andrew's Ambulance Association required more financial assistance, the ratio of allocation would be reconsidered.

The total allocation to the Scottish Branch, British Red Cross Society, during the past three years was, therefore, £335,339, 17s., and to the St Andrew's Ambulance Association £42,325, 7s. 7d.

The expenses incurred in connection with the Fund during its third year amounted to a sum of £147, 19s. 7d., being mainly for printing, stationery, and postages. These expenses were again defrayed by the Highland and Agricultural Society, which also provided the staff, office accommodation, telephone service, &c., free of charge. The Committee was, therefore, again able to hand over every penny it received, plus Deposit Receipt interest, to the benefiting charities, without any deduction whatever for expenses.

WORK OF AREA COMMITTEES.

As in the two preceding years, the Area Committees throughout the country have been the main source of income to the Fund. In the majority of cases the method of raising money by Free Gift Sales had to be abandoned on account of further drastic restrictions in the supply of petrol. These restrictions, it was feared, would interfere with the transport of stock and goods to and from sales and would also adversely affect the attendance of potential buyers. It says much for the resource and enthusiasm of the Area Committees that they quickly adjusted their organisations to the altered circumstances, and with such good effect that, instead of a falling off in revenue, they, in many cases, were successful in increasing their returns by substantial amounts.

The usual method adopted was a voluntary levy on rental, the rate being generally 1s. in the £. Many other methods of raising money, however, were resorted to, including collections, prize drawings, whist drives, dances, &c. The co-operation of other organisations within the Committees' Areas was frequently enlisted, with marked success, including the Women's Rural Institutes, Young Farmers' Clubs, Women's Land Army, and other rural organisations.

The number of Area Committees which were active during the past year was sixty-two. This was a larger number than the number which contributed in the second year, and was practically the same as the number which operated in the first year. This is explained by the fact that several Committees which raised large sums in the first year felt they could not renew their effort until after an interval of two years. They threw themselves with renewed vigour into the effort during the past year, and in most cases raised very large sums.

Following the method adopted in preceding years, the subjoined list of Committees is arranged under Show Divisions. The amounts raised in each case during the two preceding years are stated for comparison.

ABERDEEN SHOW DIVISION.

1940-41.	1941-42.		1942-43.
		<i>Aberdeenshire—</i>	
£2,647 6 3	£2,159 14 8	Aberdeen	£3,120 3 6
788 19 2	805 6 11	Alford . . . .	..
..	1,000 0 0	Cluny . . . .	..
332 14 3	..	Cromar and Upper Deeside	148 4 0
1,831 3 11		<i>Ellon Area—</i>	
	847 9 6	Ellon	1,020 2 7
	608 15 1	Foveran	1,360 14 4
	1,025 3 1	Hatton	1,051 5 0
	1,500 0 0	Tarves	2,006 0 0
	1,267 11 6	Udny	1,290 17 9
£5,600 3 7	£9,214 0 9	Carry forward . .	£9,997 7 2

1940-41.	1941-42.	1942-43.
£5,600 3 7	£9,214 0 9	Brought forward £9,997 7 2
		<i>Aberdeenshire—contd.</i>
1,241 0 0	1,744 2 2	Huntly (Strathbogie) . . . 1,782 16 6
1,435 8 4	1,264 10 1	Insch 935 0 0
2,000 0 0	2,150 0 0	Inverurie 1,470 0 0
1,506 10 0	2,500 0 0	Maud 187 12 6
..	500 0 0	Methlick 550 0 0
..	..	Oldmeldrum 258 0 0
338 12 1	..	Torphins
1,400 0 0	2,031 19 10	Turriff 1,870 19 6
		<i>Banffshire—</i>
5,020 0 0	5,553 0 0	Banff and Cornhill (Lower Banffshire) . . . 9,620 0 0
548 5 8	..	Dufftown
839 11 5	625 18 0	Keith 560 0 0
		<i>Kincardineshire—</i>
522 18 0	200 0 0	Banchory 657 11 6
2,046 0 0	2,419 11 6	Laurencekirk 2,063 5 2
866 4 2	1,064 4 6	Stonehaven 1,381 12 9
<u>£23,364 13 3</u>	<u>£29,267 6 10</u>	<u>£31,334 5 1</u>

. BORDER SHOW DIVISION.

£3,661 18 1	..	<i>Berwickshire—</i>
		Duns £4,288 14 6
		<i>Berwickshire and Roxburghshire—</i>
2,600 0 0	£2,400 0 0	St Boswells 1,500 0 0
		<i>Peeblesshire—</i>
1,355 3 9	2,765 12 0	Peebles 1,496 19 0
		<i>Roxburghshire—</i>
200 0 0	289 0 0	Hawick 250 0 0
3,274 17 9	2,322 12 3	Kelso and Jedforest . . . 3,162 19 7
182 16 2	177 15 0	Newcastleton 233 7 0
		<i>Selkirkshire—</i>
555 7 0	587 6 5	Selkirk 344 0 0
<u>£11,830 2 9</u>	<u>£9,042 5 8</u>	<u>£11,276 0 1</u>

DUMFRIES SHOW DIVISION.

£590 6 2	£753 8 0	<i>Dumfriesshire—</i>
650 0 0	600 0 0	Annan £1,676 2 9
219 0 0	..	Dumfries 700 0 0
773 15 9	..	Langholm
971 7 5	1,117 19 11	Lockerbie 2,381 3 0
		Thornhill (Upper Nithsdale) 2,000 0 0
		<i>Kirkcudbrightshire—</i>
4,000 5 3	..	Castle Douglas 13,000 3 0
<u>£7,204 14 7</u>	<u>£2,471 7 11</u>	<u>£19,757 8 9</u>

EDINBURGH SHOW DIVISION.

1940-41.	1941-42.		1942-43.
£3,109 5 2	£2,780 10 8	<i>East Lothian—</i>	
		Haddington . . .	£2,723 1 1
2,100 10 10	2,449 0 5	<i>Midlothian—</i>	
1,692 7 0	..	Dalkeith . . .	1,863 11 10
		{ Edinburgh . . .	..
		{ Western Midlothian . . .	523 0 0
		<i>West Lothian—</i>	
..	1,970 11 2	Bathgate . . .	..
1,709 8 8	1,704 12 2	Linlithgow . . .	1,029 0 0
<u>£3,611 11 8</u>	<u>£3,904 14 5</u>		<u>£6,138 12 11</u>

GLASGOW SHOW DIVISION.

..	£114 10 0	<i>Argyll—</i>	
		Kilfinan and Tighna- bruaich . . .	£202 10 0
..	..	Mid-Argyll . . .	150 0 0
£4,000 0 0	25 0 0	<i>Ayrshire—</i>	
550 0 0	..	Ayr (South Ayrshire)	3,600 0 0
		Kilmarnock (North Ayrshire) . . .	..
		<i>Lanarkshire—</i>	
2,017 10 0	..	Biggar . . .	1,570 6 8
4,009 13 9	3,636 1 8	Lanark . . .	6 19 6
750 0 0	..	Strathaven . . .	..
1,357 19 0	..	Wishaw . . .	1,034 6 0
		<i>Renfrewshire—</i>	
..	..	Paisley . . .	2,000 0 0
<u>£12,685 2 9</u>	<u>£3,775 11 8</u>		<u>£8,564 2 2</u>

INVERNESS SHOW DIVISION.

£590 5 6	£1,903 11 4	<i>Inverness-shire—</i>	
		Inverness . . .	£1,511 8 8
..	3,505 9 8	<i>Moray—</i>	
		Elgin, Forbes, &c. . .	3,475 4 9
..	..	<i>Nairnshire—</i>	
		Nairn . . .	1,130 0 0
3,968 14 6	..	<i>Ross-shire—</i>	
1,211 17 6	..	Dingwall . . .	10,613 1 9
		Tain . . .	4,886 18 8
		<i>Sutherland—</i>	
1,110 0 0	1,060 0 0	Dornoch . . .	1,166 6 11
<u>£6,880 17 6</u>	<u>£6,469 1 0</u>		<u>£22,783 0 9</u>

PERTH SHOW DIVISION.

1940-41.	1941-42.		1942-43.
		<i>Fife—</i>	
£1,465 0 0	£1,627 2 0	Anstruther . . .	£1,630 0 0
2,007 7 11	2,678 8 3	Cupar . . .	2,642 13 2
1,770 14 8	2,056 8 7	Dunfermline . . .	1,077 0 0
2,000 0 0	2,300 0 0	Thornton . . .	2,100 0 0
		<i>Kinross-shire—</i>	
1,270 0 4	1,550 0 0	Milnathort . . .	1,220 0 0
		<i>Perthshire—</i>	
1,606 3 7	..	Aberfeldy . . .	2,597 13 2
2,127 10 4	3,402 0 0	Blairgowrie . . .	4,015 12 5
4,801 3 8	5,278 19 11	Perth . . .	6,467 8 9
620 0 0	696 16 4	Pitlochry . . .	385 13 10
<u>£17,668 0 6</u>	<u>£19,589 15 1</u>		<u>£22,136 1 4</u>

STIRLING SHOW DIVISION.

		<i>Perthshire—</i>	
£2,031 11 10	£2,014 8 9	Crieff, &c. (Strathearn)	£1,647 2 5
		<i>Stirlingshire—</i>	
371 10 0	..	Drymen . . .	..
2,373 11 4	2,129 18 0	Falkirk . . .	1,034 18 3
5,013 0 0	4,610 0 0	Stirling . . .	3,200 0 0
<u>£9,789 13 2</u>	<u>£8,754 6 9</u>		<u>£5,882 0 8</u>

COUNTY OF ANGUS.

£2,309 7 0	£2,763 7 3	Arbroath . . .	£2,529 2 1
1,600 0 0	3,437 3 5	Brechin . . .	3,446 15 1
2,003 3 0	2,488 2 0	Dundee . . .	2,031 0 0
3,500 0 0	3,951 0 0	Forfar . . .	3,670 0 0
2,319 18 4	3,026 6 9	Montrose . . .	2,284 10 0
<u>£11,732 8 4</u>	<u>£15,665 19 5</u>		<u>£13,961 7 2</u>

ABSTRACT.

£23,364 13 3	£29,267 6 10	Aberdeen Show Division	£31,334 5 1
11,830 2 9	9,042 5 8	Border ..	11,276 0 1
7,204 14 7	2,471 7 11	Dumfries ..	19,757 8 9
8,611 11 8	8,904 14 5	Edinburgh ..	6,138 12 11
12,685 2 9	3,775 11 8	Glasgow ..	8,564 2 2
6,880 17 6	6,469 1 0	Inverness ..	22,783 0 9
17,668 0 6	19,589 15 1	Perth ..	22,136 1 4
9,789 13 2	8,754 6 9	Stirling ..	5,882 0 8
11,732 8 4	15,665 19 5	County of Angus . . .	13,961 7 2
<u>£109,767 4 6</u>	<u>£103,940 8 9</u>		<u>£141,832 18 11</u>

From the foregoing lists it will be seen that the Area Committees have contributed, during the third year of operations, a sum of no less than £141,832, 18s. 11d. out of the final total of £151,949, 3s. 7d.

Where all have done so well, it would appear to be invidious to single out particular centres as having done better than others. It is fully realised that in every case an immense amount of splendid constructive work has been done by the Conveners, Secretaries, Treasurers, and Members of the Area Committees, and that it is entirely due to their combined exertions and undiminished enthusiasm that such magnificent results have been attained, and a new and striking record established. The Free Gift Sale held its own special interest and appeal, and its suspension, in certain districts, for reasons previously referred to, is to be regretted. The raising of money by means of a voluntary levy is not so simple as that method might at first suggest. In order to be a success it entails careful preliminary organisation, followed up by an efficient system of collection.

As will be seen from the lists, the amounts raised by some Committees are most impressive. It is not to be assumed, however, that those Committees which sent in smaller amounts have been any less whole-hearted in their efforts on behalf of the cause. The explanation will generally be found in the fact that such Committees were operating in either smaller or less populous or less affluent areas. With this explanation, it may be permitted, therefore, to make special mention of a few outstanding returns.

The Committee records with special satisfaction that at two centres sums of over £10,000 were raised. The Stewartry Committee's effort at Castle Douglas reached the remarkable total of £13,000, and Mid and Wester Ross and the Black Isle area, with its centre at Dingwall, raised the no less notable sum of £10,613. It will be realised that such marvellous results could not have been attained without perfect organisation and whole-hearted effort on the part of the officials and members of these Committees. The Castle Douglas figure constitutes a record for any single area in Scotland. It is noteworthy that in these two cases the main effort was centred in a Free Gift Sale, which was supplemented by collections, donations, and many other activities. Thus the North and the South share the highest honours.

Next in order is Lower Banffshire, which during the first and second years held the lead for individual Area contributions. While occupying third place this year, with a total of £9620, its singular record of achievement during the three years places it easily in the premier position as regards total giving, with a magnificent aggregate of £20,193.

The Ellon Area Committee, comprising hard-working Committees at Ellon, Foveran, Hatton, Tarnes, and Udney, comes next this year with the handsome total of £6729. Perth Area Committee, which occupied second position in both the preceding years, being a close runner-up to Lower Banffshire, again is well to the fore with a splendid return of £6467. Its record for the

three years is also one of consistent and increasing effort, with an aggregate total for that period of £16,548.

Almost all the returns are worthy of special reference. It is a matter of extreme difficulty, in this necessarily brief review, to do justice and to give deserved mention to all the Area Committees, whose members and officials have striven so loyally and consistently, and indeed—as the final result proclaims—so very successfully that the third year of operations concluded with a surpassing and record total.

The Committee of the Fund acknowledges and records this great achievement with very special pride.

Other noteworthy returns were made by Tain (Easter Ross), £4887; Duns (Mid and East Berwickshire), £4289; Blairgowrie (East Perthshire), £4016; Forfar, £3670; Ayr (South Ayrshire), £3600; Elgin and Forbes, &c., £3475; Brechin, £3447; Stirling, £3200; Kelso and Jedforest, £3163; Aberdeen, £3120; Haddington, £2723; Cupar, £2643; Aberfeldy, £2598; and Arbroath, £2529.

The following list shows the amounts raised by the Area Committees, arranged in order of Counties:—

County.	1st Year, 1940-41.	2nd Year, 1941-42.	3rd Year, 1942-43.	Total.
Aberdeen . . .	£13,521 14 0	£19,404 12 10	£17,051 15 8	£49,978 2 6
Angus . . .	11,732 8 4	15,665 19 5	13,961 7 2	41,359 14 11
Argyll . . .	..	114 10 0	352 10 0	467 0 0
Ayr . . .	4,550 0 0	25 0 0	3,600 0 0	8,175 0 0
Banff . . .	6,407 17 1	6,178 18 0	10,180 0 0	22,766 15 1
Berwick . . .	4,911 18 1	1,200 0 0	5,038 14 6	11,150 12 7
Clackmannan . . .	1,000 0 0	461 0 0	235 0 0	1,696 0 0
Dumfries . . .	3,204 9 4	2,471 7 11	6,757 5 9	12,433 3 0
East Lothian . . .	3,109 5 2	2,780 10 8	2,723 1 1	8,612 16 11
Fife . . .	7,243 2 7	3,661 18 10	7,449 13 2	23,354 14 7
Inverness . . .	590 5 6	1,903 11 4	1,511 8 8	4,005 5 6
Kincardine . . .	3,435 2 2	3,683 16 0	4,102 9 5	11,221 7 7
Kinross . . .	1,270 0 4	1,550 0 0	1,220 0 0	4,040 0 4
Kirkcudbright . . .	4,000 5 3	..	13,000 3 0	17,000 8 3
Lanark . . .	7,529 17 9	3,636 1 8	2,611 12 2	13,777 11 7
Midlothian . . .	3,792 17 10	2,449 0 5	2,386 11 10	8,628 10 1
Moray . . .	..	3,505 9 8	3,475 4 9	6,980 14 5
Nairn . . .	..	..	1,130 0 0	1,130 0 0
Peebles . . .	1,960 8 9	2,765 12 0	1,496 19 0	6,222 19 9
Perth . . .	12,686 9 5	13,236 5 0	16,303 10 7	42,226 5 0
Renfrew . . .	..	..	2,000 0 0	2,000 0 0
Ross and Cromarty . . .	5,180 12 0	..	15,500 0 5	20,680 12 5
Roxburgh . . .	4,907 13 11	4,489 7 3	4,396 6 7	13,793 7 9
Selkirk . . .	655 7 0	587 6 5	344 0 0	1,586 13 5
Stirling . . .	5,258 1 4	4,434 18 0	2,809 18 3	12,502 17 7
Sutherland . . .	1,110 0 0	1,060 0 0	1,166 6 11	3,336 6 11
West Lothian . . .	1,709 8 8	3,675 3 4	1,029 0 0	6,413 12 0
	£109,767 4 6	£103,940 8 9	£141,832 18 11	
Grand total raised by the Area Committees during the three years				£355,540 12 2

As a matter of interest the sums contributed by Area Committees have been set out in the foregoing list under their respective

counties. It is to be noted that the figures relate only to sums received through Area Committees, and do not include other contributions from these counties. It is also advisable to bear in mind that an Area Committee in a county may operate from a centre so near the boundary that its activities inevitably extend into the neighbouring county or counties. While the figures given, therefore, correctly represent the allocation to the counties of sums received, they may not be taken as an absolute record of the effort of any county on behalf of the Fund.

It will be observed from the above list that Aberdeenshire heads the County list in the year under review with a total of £17,052; Perthshire is second with £16,304; and Ross-shire third with a total of £15,500.

Of the aggregate totals for the three years, Aberdeenshire also leads, and has altogether raised a grand total of £49,978; Perthshire comes second with £42,226; and Angus is third with £41,360. These are very impressive totals.

VICTORY GARDEN SHOWS AND SALES.

The Scheme of Victory Garden Shows and Sales was instituted in 1941. In the first year—season 1941—the results of the efforts made by Horticultural and Allotments Societies and Associations were very gratifying. During season 1942 continuing and increasing support was forthcoming, and almost seventy Societies and Associations held Shows or Sales for the benefit of the Fund during the months of August, September, and October. It was evident that the organisers of these Shows and Sales were intent on beating their previous records. That this was so has been amply proved by the splendid total of £3888, 15s. 7d. realised during season 1942, as against £1914, 16s. 1d. in 1941.

The horticultural community has now contributed, in various ways, a grand total of £5932, 5s. 8d. to the Fund. The Committee of the Fund is well aware that this is not the full extent of their contribution, and that Horticultural and Allotment Societies and Associations have contributed generously to the funds of the Red Cross through various County organisations and in other ways.

The various Committees entered into the organisation of their functions with great enthusiasm and ability, as is evidenced by the fact that in almost all cases the financial returns exceeded—in some cases by very handsome margins—the previous fine records.

It is difficult to commend this or that Society or Association, because, in truth, all the results reflected the greatest credit on all concerned. In some cases unfavourable weather conditions affected the quality of the crops or the attendance at the Show or Sale, and prevented that fuller measure of success so well deserved by the local organisations. In districts with small and scattered populations the results were, of course, smaller, but none the less praiseworthy.

The largest contribution was, quite appropriately, made by the

Royal Caledonian Horticultural Society, which held a Sale of Garden Produce at Edinburgh, realising the handsome sum of £288. The County Horticultural Society of East Lothian took second place with a sum of £277. Third place went to Fife, where the Kirkcaldy Joint Victory Garden Show Committee raised a sum of £175. Other outstanding results of £100 and over were from Horticultural Committees operating at Oban, £134; Carmyle, Glasgow, £130; Longeroff, £130; Bonnybridge, £129; Leven, £110; and Hillington, £100.

Considerations of space preclude further mention of other returns, both great and small, received from all over the country. Suffice it to say that the Committee of the Fund is aware of the difficulties surmounted by the district Committees, and is deeply appreciative of the highly successful results which they attained. To all these the Committee offers its grateful thanks. In this expression of thanks they would specially include all those friends, known and unknown, engaged in the prosaic and often harassing business of organisation and detail, to whose willing and untiring labours the success of the Horticulture Fund is in great measure due.

FARM WORKERS' CONTRIBUTIONS.

The returns under this head continue to improve, and, during the year under review, a total sum of £480, 12s. 11d. was received in respect of contributions from Farm Workers, as against a previous total of £272, 9s. 1d. The total of these contributions is, of course, not to be taken as the full measure of the generosity of Farm Workers, as it is recognised that in many areas Farm Workers had linked up with other local Red Cross Committees already operating with similar schemes. At the same time it is felt that the maximum of these contributions has not yet been attained, and that wider publicity of, and a suitable framework for, this scheme in certain districts would yield further increasing returns to the Fund. The Committee would be grateful if any friends in such areas as are not fully organised would be prepared to further the interests of the scheme.

Of the foregoing total of £480, 12s. 11d., no less than £192, 8s. 7d. was sent in by the Secretary of the Area Committee at Haddington, on behalf of East Lothian Farm Workers. The County thus retains its lead in respect of these contributions.

Amongst other centres which have continued to send substantial amounts are Ayr, Dalkeith, Duns, Hawick, Kelso, St Boswells, Tain, and Udney.

The Committee returns grateful thanks to all Farm Workers who have contributed, and also to all those who have given their services in collecting and forwarding these contributions.

OTHER CONTRIBUTIONS.

Apart from the results of specially organised efforts, the Fund received much valuable support from friends and organisations all

over the country, and attention may here be called to some of the varied and interesting contributions received during the third year.

The National Association of Corn and Agricultural Merchants (Scottish Council) issued a Second Appeal to its members, and, as a result, many repeated their former generous donations, and the handsome sum of £1964 was made over to the Fund. Altogether the Association has now contributed, through its Scottish members, a grand total of £4509. Similarly, Scottish Agricultural Industries Ltd., including its branches and subsidiary companies in the Scottish Area, made a second handsome donation of £500.

The Committee is pleased to report that the Aberdeen and District Milk Marketing Board continues to support the Fund by periodical contributions from its milk producers. In the third year the Board returned the generous sum of £463, and altogether, during the past three years, the Fund has benefited to the extent of £1063 from this source. A most welcome donation was that of 200 guineas from the British Basket & Besto Co. Ltd., Crownpoint Road, Glasgow.

Another substantial donation of £350 was allocated from the County of Dumbarton War Benevolent Fund, being part of the proceeds of a Free Gift Sale and Collection organised by the Dunbartonshire Agricultural Society. Altogether the Fund has now received from the County Fund a total of £1100.

A welcome second donation of £100 was received from the Aberdeen-Angus Cattle Society, and a generous contribution of £100 from the Bathgate Agricultural Association.

The ever-popular Whist Drive and Dance provided wholesome entertainment in the long dark evenings as well as grist for the Fund. Of the sums arising from such functions, the Western District of Atholl Agricultural Association sent an outstanding one of £167, and the Mearns Agricultural Society returned the handsome sum of £106. Amongst other staunch supporters of the Fund sending in the proceeds of such functions were: Shettleston and Chryston Branch of the N.F.U., £80; Kincardineshire Farmers' Club, £48; Lanark Agricultural Discussion Society, £32; Crossroads and District Young Farmers' Club, £28; Udney Farm Servants' Union, £25. Mr Alexander Waddell, Dewshill Farm, Salsburgh, Motherwell, sent in sums totalling £50, and girls of the Land Army at Sunnyside, East Lothian, £26.

Perth Ram Society continued its steady support of the Fund, and handed over a further sum of £27—its fourth donation. The staff of the Edinburgh and East of Scotland College of Agriculture maintained their quarterly contributions, amounting to £42 annually. The Orichton Royal Institution, Dumfries, sent a welcome second donation of £35.

As the result of Horse Parades or Foal Shows, the following sums were received: East Lothian Farm Workers (Haddington), £80; Lockerbie and District Entire Horse Society, £65; and Lanark, Biggar, and Peebles Foal Show Society, £19.

During the 1942 harvest boys of various schools volunteered to share in the work. Amongst these were boys from Loretto School

(Musselburgh), Trinity College (Glenalmond), and George Watson's College (Edinburgh), who between them sent to the Fund a total of £114, mainly in respect of their harvest earnings. The Committee views with warm appreciation this voluntary response on the part of the boys.

Space forbids mention of other sums received. To all these generous friends of the Fund, whether engaged in commerce, industry, or otherwise, the Committee is indebted in full measure. For their liberality and for the continuing support given, the Committee of the Fund returns its sincere and grateful thanks.

ACKNOWLEDGMENTS.

The success of the Fund during its third year is again mainly due to the splendid work done by the Area Committees. When it is realised how much time and energy, how much thought and planning, are devoted to the organisation and carrying through of these Area Committees' efforts, it is felt that words are inadequate to express sufficiently the General Committee's gratitude and thanks. To raise the very large sums recorded in this report the Committees concerned have not only worked untiringly themselves, but have succeeded in enlisting the help and co-operation of other organisations in their areas. In particular they have been fortunate in securing the adhesion of the various women's organisations. While this has been specially reported in regard to Aberdeenshire and Ross-shire, it is known that throughout the country generally the Ladies' Committees have been highly successful in their generous enterprises, and have raised very substantial sums for the Fund. To the Area Committees, their Conveners, Members, Secretaries and Treasurers, and all associated with them in their marvellous effort, the Committee of the Fund acknowledges its debt of gratitude. To them, in outstanding measure, is due the credit that in this, its third year, the Agriculture Fund has been enabled to attain a new proud record of contributions to the Red Cross.

While Free Gift Sales have not figured so prominently during the past year as in the two preceding years, it is yet true to say that they have played no unimportant part in the year's activities. At both Castle Douglas and Dingwall the main effort, as already mentioned, was centred in a Free Gift Sale. At many other centres a Free Gift Sale or Sales contributed to the total. As formerly acknowledged, these Sales could not have been held without the help of the Live Stock Auctioneers, who have always given freely of their services, the services of their staffs, and the use of their marts. In several cases, also, individual Auctioneers have acted as Conveners of Area Committees, and members of their staffs have acted as Secretaries and Treasurers. The notable help given by the Auctioneers and their staffs is again acknowledged, and the Committee places on record its high appreciation of the valuable work done by them on behalf of the Fund.

Grateful acknowledgment is again made of much valuable help

and co-operation extended to the Committee by the Directors and Members of the Highland and Agricultural Society, and by the Council, Members, and Officials of the National Farmers' Union and Chamber of Agriculture of Scotland. As stated in previous reports, the representatives of these bodies, and of the County and District Agricultural Societies throughout the country, form the backbone of the Area Committees. The local branches of the N.F.U. and Chamber have provided, in many cases, a ready-made basis for the Area Committees, or have indeed simply assumed the duties of such Committees. In other areas a similar service has been rendered by the County and District Agricultural Societies. To all these bodies the Committee extends its most sincere thanks for the splendid work which they have achieved. The Scottish Farm Servants' Union has continued to foster and encourage the scheme of contributions by farm workers, and the result of their efforts is reflected in the increasing returns.

The cordial thanks of the Committee to Horticultural Societies and Allotment Associations, to Farm Workers, and to various commercial interests and Agricultural Societies and Associations, has been expressed in preceding sections of this report dealing with these matters.

The Scottish Press has continued throughout the year to give valuable publicity to the Fund. Both agricultural and daily newspapers have given prominence to news and items of interest regarding its progress. Without this assistance the Committee would have been greatly handicapped in its efforts, and it has pleasure in recording its sense of gratitude to the newspapers concerned.

The Committee has continued to work in the closest and most cordial relations with the Red Cross Agriculture Fund Committee in England. The activities of that Committee are on an extensive scale, as may be judged from the fact that since its institution in December 1939 it has raised a sum of over Two Million pounds. Its organisation covers a wide variety of efforts, many of which could not be adopted in Scotland, but through the courtesy of the Chairman of the Committee and the Secretary, all information regarding its activities are constantly placed at the disposal of the Scottish Committee. The Chairman of the Committee, Mr R. W. Haddon, sends a monthly letter containing valuable particulars of all their schemes and the progress they are making. The Convener of the Horticultural Committee, Mr Walter Brett, has been unremitting in supplying information regarding the Victory Garden Show movement, and the introduction of the scheme in Scotland is mainly due to his kindly guidance and enthusiasm. The Secretary of the English Committee, Mr Alec D. Robertson, has continued to be an inexhaustible source of information and guidance, and his unfailing courtesy and prompt attention to every request for help or information is most gratefully acknowledged.

JOHN STIRTON,
Hon. Secretary and Treasurer

8 EGLINTON CRESCENT,
EDINBURGH 12, 19th May 1943.

**ABSTRACT OF RECEIPTS AND PAYMENTS BY THE HON. SECRETARY
AND TREASURER FOR THE THIRD FINANCIAL YEAR, 17TH APRIL 1942
TO 16TH APRIL 1943.**

<i>2nd Year— 1941-42.</i>	<i>Receipts.</i>	<i>3rd Year— 1942-43.</i>
	1. Sums raised by Area or Centre Committees, being the proceeds of Free Gift Sales, Voluntary Levies or Assessments, Collections, &c.	£141,832 18 11
£103,940 8 9	2. Victory Garden Shows—Proceeds of Shows and Sales held by Horticultural and Allotment Societies, also Donations, &c.—Season 1942	3,888 15 7
1,914 16 1	3. Contributions from Farm Workers (Penny-a-Week Scheme)	480 12 11
272 9 1	4. Agricultural and Allied Bodies—	
231 6 0	(1) Donations, &c.	£468 10 10
766 15 2	(2) Proceeds of Whist Drives and Dances	592 13 10
		1,061 4 8
700 8 9	5. Agricultural and Commercial Interests—	
750 0 0	Donations &c.	3,145 1 0
1,140 16 2	6. Grants from County War Funds	350 0 0
	7. Unclassified Contributions	1,058 8 5
£109,717 0 0		£151,817 1 6
122 6 10	8. Interest on sums placed on Deposit Receipt for short periods	132 2 1
£109,839 6 10		£151,949 3 7

Payments.

	1. Expenses of Administration—	
£33 0 0	(1) Postages	£25 0 0
22 19 7	(2) Stationery, &c.	22 12 2
67 15 5	(3) Printing, &c.	90 13 11
4 9 9	(4) Miscellaneous Payments	9 13 6
£128 4 9	Total	£147 19 7
128 4 9	Received from the Highland and Agricultural Society of Scotland to defray expenses	147 19 7
	2. Payments to benefiting Charities—	
	(1) Scottish Branch, British Red Cross Society	£144,023 1 7
£93,855 8 1	(2) St Andrew's Ambulance Association	7,926 2 0
10,983 18 9		
£109,839 6 10		151,949 3 7
£109,839 6 10		£151,949 3 7

EDINBURGH, 10th May 1943.—I have examined the Books and Accounts of the Treasurer of THE SCOTTISH RED CROSS AGRICULTURE FUND COMMITTEE, of which the foregoing is an Abstract, and have found the same to be correctly stated, and sufficiently vouched and instructed.

GEO. JAMES GREGOR, C.A., *Hon. Auditor.*

LIST OF CONVENERS AND SECRETARIES, &C., OF THE AREA COMMITTEES.

Centre.

- ABERDEEN** . *Convener*—Lord Provost Sir Thomas G. Mitchell, Aberdeen.
Hon. Secretary—Robert C. May, Advocate, 77 Crown Street, Aberdeen.
- ABERFELDY** . *Convener*—Provost J. D. Haggart, O.B.E., Aberfeldy.
Hon. Secretary—R. J. Cameron, Bank of Scotland, Aberfeldy.
- ALFORD** . *Convener*—D. F. Proctor, Tillyfour, Tough, Whitehouse.
Joint Hon. Secretaries—J. S. Annand, Commercial Bank of Scotland, Alford; A. Imlach, Ellangowan, Alford.
- ANNAN** . *Convener*—Colonel F. J. Carruthers, C.B., of Dormont, Lockerbie.
Hon. Secretary—Alec Knox, Solicitor, British Linen Bank, Annan.
- ANSTRUTHER** . *Convener*—Harry Thomson, Newark, St Monance.
Hon. Secretary—J. Gordon Dow, Solicitor, Anstruther.
- ARBROATH** . *Joint Conveners*—H. W. Dodds (Scott & Graham Ltd.), Arbroath; Percy E. Morgan, Windyhills, Arbroath.
Hon. Secretary—Mrs J. B. Meikle, 1 Golf Avenue, Monifeth.
Hon. Treasurer—W. Stark, British Linen Bank, Arbroath.
- AYR (South Ayrshire)** . *Convener*—General Sir Charles Fergusson, G.C.B., G.C.M.G., D.S.O., &c., of Kilkerran, Bt., Maybole.
Hon. Secretary—Hugh Bone, 58 Alloway Street, Ayr.
- BANCHORY** . *Convener*—G. Davidson, Nether Balfour, Durris, Drumoak.
Hon. Secretary—David Humble, The Ley, Banchory.
- BANFF & CORNHILL (Lower Banffshire)** . *Joint Conveners*—Provost John C. H. Addison, Banff; Alexander Forbes, Rennie, Banff.
Hon. Secretary—James M. Simpson, M.A., LL.B., Solicitor, Banff.
- BATHGATE** . *Convener*—James Aitken, Halfway House, Whitburn.
Joint Hon. Secretaries—John Alston, 13 Mid Street, Bathgate; P. A. Simpson, Commercial Bank House, Whitburn.
- BIGGAR** . *Convener*—Thomas B. Murray, Spittal, Biggar.
Hon. Secretary—James Noble, Gowanlea, Symington, Biggar.
Hon. Treasurer—James Dunlop, Norwood, Biggar.
- BLAIRGOWRIE** . *Convener*—Rev. A. Wylie Smith, The Manse, Bendochy, Coupar-Angus.
Hon. Secretary—William Inverarity, C.A., Blairgowrie.
- BRECHIN** . *Joint Conveners*—W. Arnot, Fithie, Brechin; W. D. Mackenzie (The Farmers' Mart Ltd.), Brechin.
Hon. Secretary—George White (The Farmers' Mart Ltd.), Brechin.
- CASTLE-DOUGLAS** . *Chairman*—R. G. D. Thomas of Southwick, Dumfries.
Hon. Secretary—Richard J. Singer (Wallets' Marts Ltd.), Castle-Douglas.
- CLUNY, &c.** . *Convener*—H. N. A. Claeson Gordon of Cluny, Cluny Castle, Cluny.
Hon. Secretary—H. R. Mollison, Cluny Estates Office, Aberdeen.
- GRIEFF, &c. (Strathearn)** . *Joint Conveners*—Sir J. Denby Roberts, Bt., Strathallan Castle, Auchterarder; Duncan M. Stewart of Millhills, Crieff.
Hon. Secretary—John D. S. Miller, M.A., B.L., 14 Cornie Street, Crieff.
- CROMAR & UPPER DEESIDE** . *Convener*—Lieut.-Colonel W. Lilburn of Coull, Aboyne.
Hon. Secretary and Treasurer—J. T. Taylor, Bank House, Tarland.
- CUPAR** . *Convener*—David Blair, Littleinch, Wormit, Fife.
Hon. Secretary—William Wilson, W.S., Cupar-Fife.
- DALKETH** . *Convener*—John M'Morran, Tynehead Farm, Tynehead, Midlothian.
Hon. Secretary—D. M. Webster (John Swan & Sons Ltd., Auctioneers), 5 Clifton Terrace, Edinburgh.
- DINGWALL** . *Conveners*—J. Houston, Scatwell, Muir-of-Ord; Mrs MacWilliam, Garguston, Muir-of-Ord.
Vice-Conveners—A. Mann, Muiralehouse, Avoch; Miss Moore, Drummond, Evanton; A. Macdonald, Canon Brae, Canon Bridge.
Hon. Secretary—T. H. Burns, Solicitor, Dingwall.
- DORNOCH** . *Convener*—G. J. Grant, Pulrossie, Dornoch.
Hon. Secretary—D. G. Munro, Cyderhall, Dornoch.
- DRYMEN** . *Correspondents*—Robert Bilsland, Secretary, Strathendrick Agricultural Society, Alexandria, Dumbartonshire.
- DUFFTOWN** . *Convener*—Hugh M'Vean, M.R.C.V.S., Craigellachie.
Hon. Secretary—J. S. Shiach, North of Scotland Bank, Dufftown.
- DUMFRIES** . *Convener*—James Wyllie, Beaumont, Victoria Road, Dumfries.
Hon. Secretary—James Henderson, Solicitor, Dumfries.
- DUNDEE** . *Joint Conveners*—Alan Fraser (Peter M'Intyre Ltd., Auctioneers), Dundee; David Goodfellow, Bahuth, Tealing, by Dundee.
Hon. Secretaries—J. Grafton Lawson & Co., Solicitors, Dundee.
- DUNFERMLINE** . *Convener*—William Dick, Transy, Dunfermline.
Hon. Secretary and Treasurer—W. Craig Husband, Union Bank Chambers, Dunfermline.
- DUNS** . *Convener*—H. C. Falcener, Auchenerow Mains, Reston.
Hon. Secretary—J. G. Fairbairn, Ramrig, Northam-on-Tweed.
Hon. Treasurer—A. C. Fotheringham, The Bowes, Gordon.

Centre.

- EDINBURGH** . *Convener*—Robert Park, Brunstane, Portobello, Midlothian.
Hon. Secretary—Miss Ann Cowan Telfer, Royal Bank of Scotland, Hope Street, Edinburgh.
- ELGIN, FORRES, &c.** *Convener*—John Fettes, Corskie, Garmouth.
Hon. Secretaries—(Elgin) D. G. Leslie, 92 High Street, Elgin; (Forres) Pat Mackenzie, 131 High Street, Forres; (Knockando and Elchies) C. Cruikshank, Rynagarrie, Carron.
- ELLON** . *Convener*—John B. Ross, Auchterellon, Ellon.
Joint Hon. Secretaries—James Mutch and William Watson, 20 The Square, Ellon.
- FALKIRK** . *Convener*—Robert Waugh (Thomas Binnie Ltd., Auctioneers), Falkirk.
Hon. Secretary—.....
- FORFAR** . *Joint Convener*—George D. Scott (Scott & Graham Ltd.), Forfar;
 Ralph S. Thomson (Strathmore Auction Co., Ltd.), Forfar.
Joint Hon. Secretaries—Alex. E. Glennie (Strathmore Auction Co., Ltd.), Forfar; John L. Wishart (Scott & Graham Ltd.), Forfar.
- FOVERAN** . *Convener*—John Duguid, Burnbank, Newburgh.
Vice-Convener—John Stott, Kincairg, Foveran.
Hon. Secretary—David S. Minto, Little Haddo, Newburgh.
Hon. Treasurer—William Christie, Bank House, Newburgh.
- HADDINGTON** . *Convener*—A. G. Spence, Lempockwells, Pencaitland.
Hon. Secretary—David S. Burnet, Solicitor, Haddington.
- HATTON** . *Joint Convener*—Peter Mackie, Nethermill Farm, Cruden Bay; James Ogston, Bridgend, Cruden Bay.
Joint Hon. Secretaries—James Cruikshank, Hatton Farm, Hatton; G. D. Rumbles, Hatton.
Hon. Treasurer—F. W. Ferrier, Bank House, Cruden Bay.
- HAWICK** . *Convener*—Walter J. Grieve, Clairmont, 20 Orchard Terrace, Hawick.
Vice-Convener—Douglas Oliver (Andrew Oliver & Sons Ltd., Auctioneers), Hawick.
Hon. Secretary—Andrew Haddon, Solicitor, Hawick.
- HUNTLY (Strathbogie).** *Convener*—A. Dutton, Corse, Kinnoir, Huntly.
Hon. Secretary and Treasurer—James Ogilvie, Commercial Bank Buildings, Huntly.
- INSCH** . *Convener*—James Downie, Waterton, Inch.
Joint Hon. Secretaries—James Barelay, Tocherford, Wartle; Alexander Watt, Cairnhill, Rothney, Inch.
- INVERNESS** . *Convener*—H. G. Johnston, Culduthel, Inverness; Mrs K. P. MacGillivray, Kirkton, Bunchrew; Mrs Charley Tinker, Kilmartin, Glenurquhart.
Hon. Secretary—R. H. E. Fraser, Wester Feabuie, Culloden Moor.
- INVERURIE** . *Joint Convener*—R. C. M. Maitland, West Balhagardy, Inverurie; James A. Stephen, Conglass, Inverurie.
Hon. Secretary—Robert Philip, Bank House, Inverurie.
- KEITH** . *Convener*—George Taylor, 15 Regent Street, Fife-Keith, Keith.
Hon. Secretary and Treasurer—John C. Gray, North of Scotland Bank Buildings, Keith.
- KELSO & JEDFOREST**—
- KELSO** . *Convener*—R. H. Allan, Smailholm Mains, Kelso.
Hon. Secretary—James K. Bell, Royal Bank of Scotland, Kelso.
Hon. Treasurer—J. G. G. Leadbetter, W.S., Kelso.
- JEDFOREST** . *Convener*—William L. Johnston, Oxnam Neuk, Jedburgh.
Vice-Convener—John C. Brown, Hundalee, Jedburgh.
Hon. Secretary—John Mabon (William Mabon & Sons, Auctioneers), Jedburgh.
- KILFINAN & TIGH-NABBRAICH** *Correspondent*—James Nicolson, Hon. Secretary of the District Farmers' Association, Auchgoyle, Millhouse, Tighnabruach.
- KILMARNOCK (North Ayrshire).** *Correspondents*—Thomas Donald & Sons, Auctioneers, Kilmarnock.
- LANARK** . *Convener*—Ian Clark (Lewrie & Symington Ltd., Auctioneers), Lanark.
Vice-Convener—J. MacLaren, Springhill, Douglas, Lanark.
Hon. Secretary—.....
- LANGHOLM** . *Assistant Hon. Secretary*—J. Murie, Royal Bank of Scotland, Lanark.
Convener—J. J. Paterson, Terrona, Langholm.
Hon. Secretary—James M'George, Solicitor, Langholm.
- LAURENCEKIRK** . *Convener*—G. H. Russell of The Burn, Glenesk, Brechin.
Hon. Secretary and Treasurer—Rowland Reed, Solicitor, Laurencekirk.
- LENLITHGOW** . *Convener*—David Allison, Duddingston, South Queensferry.
Hon. Secretary—John Cochran, Waterstone, Uphall.
- LOCKERBIE** . *Chairman*—William Hodge, Slodahill, Lockerbie.
Joint Hon. Secretaries—R. Y. Mackay, Solicitor, Lockerbie; George Stevenson, Solicitor, Lockerbie.

Centre.

- MAUD** . *Convener*—Douglas J. Fowlie, Millhill, Mintlaw.
Joint Hon. Secretaries—George Dalgarno, Rashboglea, New Deer; Robert Scott, Solicitor, Fraserburgh.
- METHLICK** . *Convener*—The Marquis of Aberdeen, O.B.E., Haddo House.
Hon. Secretary—John Beaton, Bank Agent, Methlick.
- MID-ARGYLL** . *Correspondent*—Major J. G. Mathieson, Secretary, Mid-Argyll Agricultural Society, Ri-Cruin, Kilmartin, Lochgilphead.
- MIDLOTHIAN, Western.** *Hon. Secretary*—Maxwell C. Dick, Western District of Midlothian Agricultural Association, 125 Constitution Street, Leith.
- MILNATHORT** . *Convener*—James Paton, Kirkness, Glencraig.
Hon. Secretary—George Wilson, Solicitor, Kinross.
Hon. Treasurer—William C. Forrester, British Linen Bank, Kinross.
- MONTROSE** . *Convener*—W. J. Reid, Fordhouse of Dun, Montrose.
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THE CEREAL AND OTHER CROPS OF SCOTLAND FOR 1942.

THE following comparison of the cereal and other crops of 1942 with those of the previous year has been prepared by the Secretary of the Society from answers to queries sent to leading agriculturists in different parts of the country.

The queries issued by the Secretary were in the following terms :—

1. What was the quantity, per imperial acre, and quality of grain and straw as compared with last year, of the following crops? The quantity of each crop to be stated in bushels or cwts. What quantity of seed is generally sown per acre?—(1) Wheat (2) Barley, (3) Oats.
2. Did the harvest begin at the usual time, or did it begin before or after the usual time? and if so, how long?
3. What was the quantity, per imperial acre, and quality of the hay crop, as compared with last year, both as regards ryegrass and clover respectively? The quantity to be stated in tons and cwts.
4. Was the meadow hay crop more or less productive than last year?
5. What was the yield of the potato crop, per imperial acre, as compared with last year? The quantity to be stated in tons and cwts. Was there any disease? and if so, to what extent, and when did it commence? Were any new varieties planted, and with what result?
6. What was the weight of the turnip crop, per imperial acre, and the quality, as compared with last year? The weight of the turnip crop to be stated in tons and cwts. How did the crop braird? Was more than one sowing required? and why?
7. Were the crops injured by insects? State the kinds of insects. Was the damage greater or less than usual?
8. Were the crops injured by weeds? State the kinds of weeds. Was the damage greater or less than usual?
9. Were the pastures during the season of average growth and quality with last year?
10. How did stock thrive on them?
11. Have cattle and sheep been free from disease?
12. What was the quality of the clip of wool, and was it over or under the average?

From the answers received, the following notes and statistics have been compiled:—

EDINBURGH DISTRICT.

MID-LOTHIAN. *Wheat*—A very fine crop; this cereal as well as others had yields above the average; 52 bushels per acre. *Barley*—50 bushels per acre. *Oats*—60 bushels per acre. *Harvest*—Began about usual time; all grain very well secured with first-class weather. *Hay*—A good crop and very well secured; 40 to 50 cwt. per acre. *Meadow Hay*—A good crop. *Potatoes*—A specially good crop; 8 to 10 tons on the good potato land; very free from disease. *Turnips*—A very heavy crop; little or no reseedling, and free from any disease. *Insects*—Little damage. *Weeds*—Little damage; all crops particularly clear. *Pastures*—Good. *Live Stock*—Did very well, and remained healthy. *Clip of Wool*—Average crop of good quality.

WEST LOTHIAN. *Wheat*—Autumn sown, 38 to 44 bushels per acre; very little spring sown; grain and straw of good quality; seed sown, $3\frac{1}{2}$ to 4 bushels per acre. *Barley*—46 to 56 bushels per acre; grain and straw of good quality; seed sown, 3 to $3\frac{1}{2}$ bushels per acre. *Oats*—56 to 72 bushels per acre; grain and straw of excellent quality; seed sown, $4\frac{1}{2}$ to 6 bushels per acre according to variety. *Harvest*—Began about the usual time, cutting being general by 20th August; with the best of harvest weather in September good progress was made. *Hay*—40 to 50 cwt. per acre; a good crop secured in good order. *Meadow Hay*—Very little grown. *Potatoes*—Earlies, 10 to 12 tons per acre; main crops, 8 to 10 tons per acre; practically no disease; one of the best potato years for a long time; no new varieties planted. *Turnips*—25 to 30 tons per acre; a large crop all over; no resowing required; crop braided well. *Insects*—Practically no damage recorded. *Weeds*—Crops uninjured in spite of so much cross cropping; damage less than usual. *Pastures*—Average growth, and good quality. *Live Stock*—Throve well. Cattle and sheep comparatively free from disease. *Clip of Wool*—Average quality and crop.

EAST LOTHIAN (Upper). *Wheat*—Much better yield than for many years; 48 to 56 bushels per acre; grain and straw harvested in good condition; seed sown, $3\frac{1}{2}$ to 4 bushels per acre. *Barley*—Above average, 46 to 56 bushels per acre; straw similar to last year; harvested in good condition, nearly all top grade; seed sown, 3 to $3\frac{1}{2}$ bushels per acre. *Oats*—Above average, 54 to 68 bushels per acre; harvested in good condition; seed sown, 4 to $5\frac{1}{2}$ bushels per acre; marginal land yields, 40 to 46 bushels per acre. *Harvest*—Started a few days earlier than last year; one of the best for years, and with soldiers and W.L.A. assistance was finished in record time. *Hay*—Fair crop, rather under last season's owing to dry May and June; 40 to 50 cwt. per acre. *Meadow Hay*—Very little grown; similar to previous years. *Potatoes*—Rather under average, $7\frac{1}{2}$ to 9 tons per acre; lifted and stored in good condition; a long harvest owing to shortage of labour; very little damage by frost; practically no blight, leaf curl, or other disease; very little sprain; no new varieties grown. *Turnips*—Quite a good crop; did not come to the hoe so quickly but grew steadily and finished better than last year, 16 to 20 tons per acre; mangolds, about 20 per cent under last season's crop; sugar-beet, small crop—nearly 30 per cent under average. *Insects*—Something similar to

last year. *Weeds*—Owing to cross cropping under war conditions land tended to get dirtier; green crops not so well cleaned owing to shortage of labour; thistles not so bad as last season, but charlock and soft weeds much worse. *Pastures*—Came away rather earlier and grazed well all season; growth rather under last year. *Live Stock*—About average; cattle and sheep grazed well and were free from disease. *Clip of Wool*—Better than previous year; about average.

EAST LoTHIAN (Lower). *Wheat*—Yield very good; average about 56 bushels per acre; straw about 2 tons per acre; crop secured in good condition; seed sown, 3 to 4 bushels per acre. *Barley*—Yield remarkably good; 64 bushels per acre or more on the best barley land; well got and quality good; seed sown, $2\frac{1}{2}$ to 3 bushels per acre where the proper tilth had been secured. *Oats*—No more than an average crop owing to dry season; yield on good land 72 to 80 bushels per acre; quality good; straw rather under average as a rule, about 30 cwt. per acre. *Harvest*—A little later than usual in starting owing to late, dry spring, but the harvest was speedy, and all crops in the low country were quickly secured in good condition. *Hay*—Crop, mostly Italian ryegrass with a limited amount of red clover, was under average owing to hard, dry weather; yield on the average not much over 2 tons per acre; no clover hay grown. *Meadow Hay*—None grown. *Potatoes*—Yield good, but lighter than last year's bumper crop; 8 tons per acre; scarcity of labour prevented much spraying, and there was some disease in some fields of Great Scot. Potato harvesting was prolonged owing to large acreage and scarcity of labour, but the weather was favourable, and the crop was ultimately got up free of frost; yields of early potatoes very variable owing to severe spring weather, and digging was considerably later than usual. *Turnips*—Yield quite good, 22 to 25 tons per acre; brairding slow owing to dry weather, but not much resowing required. *Insects*—Damage insignificant except perhaps in the western part of the seaboard, where the swede midge continued to give trouble. *Weeds*—Not particularly harmful, but owing to scarcity of labour there was some difficulty in keeping them down, but the dry season was helpful. *Pastures*—Barely up to the average, but under the plough-up policy there was little left; the quality was good. *Live Stock*—Did well; there was an outbreak of foot-and-mouth disease in the western part of the county, which caused the usual temporary inconvenience, but it was quickly eradicated; and there was nothing else unusual except another very severe winter, which was hard on hill-sheep stocks. *Clip of Wool*—About an average.

BORDER DISTRICT.

BERWICKSHIRE (Merse). *Wheat*—A smaller acreage owing to weather conditions at sowing-time; average, 42 bushels per acre, with some considerably higher; grain and straw of good quality; grain, $62\frac{1}{2}$ lb. per bushel; straw, 32 cwt. per acre; seed sown, $3\frac{1}{2}$ to 4 bushels per acre. *Barley*—Generally a good crop with an over-average yield of 48 bushels per acre; natural weight, 55 lb. per bushel; quality good; straw, average bulk and well got; 23 cwt. per acre; $2\frac{1}{2}$ to 3 bushels per acre the usual seeding. *Oats*—A good crop all over; in most cases readily handled at harvest; yields up to 64 bushels per acre not uncommon, with an average of 54 bushels; natural weight, 42 lb. per bushel; straw, fine quality; average 26 cwt. per acre; seed sown, 5 to 6 bushels per acre. *Harvest*—It was well into August before harvest commenced, and on the whole it was

very satisfactory, though grain often had to stand in stock longer than advisable on account of labour shortage; work generally completed about the beginning of October. *Hay*—Lighter than last year by some cwts. per acre, with an average of 36 cwt.; quality was particularly good and the crop well mixed with clovers. *Meadow Hay*—Less productive than in previous year, and not so well got. *Potatoes*—2 tons per acre less than last year—i.e., 6 tons as against 8; little or no disease and the crop kept well. *Turnips*—Swedes, 26 tons; yellows, 20 tons per acre; swedes, fine quality and kept well; yellows, lacked sap and were somewhat fibrous; very little resowing had to be done. *Insects*—No damage reported. *Weeds*—Crops not unduly injured, though thistles were too much in evidence in cereal crops sown after a lea that had lain for a few years or when a second or third white crop had to be taken; charlock still too prevalent. *Pastures*—Quality was good, but growth generally was under average. *Live Stock*—Sheep did very well, but pastures were too bare for cattle during the forepart of the season. Cattle and sheep were generally free from disease. *Clip of Wool*—Average quality and weight.

BERWICKSHIRE (Lammermoor). *Wheat*—Area sown larger than last year; in some cases crops were sown at an altitude of 700 to 800 feet; the crop survived the winter well and practically no failures were reported; on the whole the crop was clean; yield, 40 bushels per acre; quality of grain good; seed sown, $3\frac{1}{2}$ to 4 bushels per acre. *Barley*—Again a larger area sown; yield better than last year, varying from 40 to 48 bushels per acre; quality of grain very good; seed sown, $3\frac{1}{2}$ to 4 bushels per acre. *Oats*—A considerable increase over last year's acreage sown; crop more successful and over all very good yields were secured; yield, 56 to 64 bushels, with some crops giving up to 80 bushels per acre; quality of sample good, natural bushel weight, 41 to 42 lb.; seed sown, 4 to 6 bushels per acre. *Harvest*—Commenced at usual time, towards end of August; shortage of labour and increased acreage lengthened operations, but good weather resulted in a record crop being secured in first-class condition. *Hay*—Dry spell in May affected crop, which was lighter than last year; yield, $1\frac{1}{4}$ tons per acre where not grazed; secured in good condition. *Meadow Hay*—Average crop; well secured. *Potatoes*—Increased acreage planted; crop not so good as last year, but successfully secured; yield, 6 to 7 tons per acre; some blight, but not to a serious extent; no new varieties of note. *Turnips*—Over all a very good crop; yield, 20 tons per acre, equal to last year's; brairded well; very little resowing. *Insects*—No trouble experienced. *Weeds*—Some fields carrying second white crop badly infested with thistles; as a result of previous double white cropping, some of the root breaks were dirty; shortage of labour led to difficulties in proper cleaning; annuals prevalent in turnip crops. *Pastures*—Were not of full bite early in the season, but came away well in June; growth continued well into the end of the year; quality good. *Live Stock*—All classes thrived well and were comparatively free from disease; some abortion in ewe stocks. *Clip of Wool*—Hill sheep clip, light; low ground clip, average; good quality.

ROXBURGHSHIRE. *Wheat*—Winter wheat, generally good standing crops; yield exceptionally good in most cases, 60 bushels per acre common; spring-sown wheat, while bulky, did not yield nearly so well, 44 bushels per acre about the average; seed sown, about 4 bushels per acre. *Barley*—Generally the bulk was rather over normal; a few big crops were badly lodged; in most cases the yield proved above average and in fact phenomenal, returns of 64 bushels per acre having been often obtained; frequently

the big runs have been from land on the wider rotation; seeding, 2 to 3½ bushels per acre. *Oats*—Bulk above normal and yields of grain were beyond all expectations, including numerous cases of 96 to 100 bushels per acre; fewer bad crops were to be seen on the poor land, and the increased yield above last year on this class of land was at least 8 bushels per acre; seed sown, 4 to 6 bushels per acre according to sowing method and type of land. *Harvest*—Started about the usual time; crops ripened fairly regularly and evenly; weather was broken, but was not wasteful except in the latest districts; owing to the length of the harvest operations, expenses were very heavy. *Hay*—Ryegrass, average crop of first-class quality. *Meadow Hay*—Bulked less than last year, and, while it was good in quality and well got in the east part of the county, it was in many cases entirely lost owing to bad weather conditions in the west. *Potatoes*—A big yield, sound and good. *Turnips*—Came regularly to the hoe, but were not quite so big as last season; some crops above normal, others smaller and disappointing. *Insects*—Very few complaints of damage, but some reports of the turnip midge. *Weeds*—Damage about normal; turnip hoeing in many cases could not be undertaken for want of labour. *Pastures*—Always fresh, with regular growth. *Live Stock*—Sheep did well, but pastures were often too bare for cattle. Cattle generally healthy; nothing unusual except a recurrence amongst lambs of pneumonia in September and October; in many cases this was serious. *Clip of Wool*—About average.

SELKIRKSHIRE. *Wheat*—Very little grown. *Barley*—Rather more grown than in previous years, and crop fairly satisfactory; yield, 35 to 40 bushels per acre; seed sown, 3½ to 4 bushels per acre. *Oats*—Sowing generally was not completed until the beginning of May, and drought in June and July checked the growth, but with rain later an average crop for the district resulted, except on poor marginal land; yield, 38 to 45 bushels per acre on good land; 20 to 24 bushels per acre on the poorer fields. *Harvest*—Was generally a week or ten days later than usual, but was not difficult to cut, and although it lasted six to seven weeks there was not much spoiled grain. *Hay*—A very light crop, due to the drought in June and July, but secured in quite good condition. *Meadow Hay*—Was a similar crop, affected by the same conditions. *Potatoes*—An increased acreage planted, but crop only moderate at 6 to 7 tons per acre; no disease to speak of when lifted. *Turnips*—20 to 25 tons per acre; braided well and there was little or no resowing; good crop of good quality; not so much finger-and-toe disease as usual. *Insects*—No injury caused. *Weeds*—Damage no more than usual when labour could be got to keep weeds down; a few farmers, on account of labour shortage, sowed their turnips broadcast, but the result, except on clean land, was very unsatisfactory. *Pastures*—There was a shortage of grass all season, due to the drought, and through carrying more stock on account of ploughing-up campaign. *Live Stock*—Lambs were not so well grown and lacked the condition of former years; cattle and sheep were free from disease. *Clip of Wool*—Under average.

PERBLESSHIRE. *Wheat*—A much larger acreage grown, and generally the crop was a good one and ripened well; average, 40 to 48 bushels per acre. *Barley*—In most cases a good crop, but very badly laid in some parts; the yield varied from 36 to 50 bushels per acre; samples mostly good. *Oats*—Greatly increased acreage, and where sown in time the crop was excellent; on good land 56 to 64 bushels per acre was the average yield; on poorer land and where late in being sown crops were disappoint-

ing, averaging 24-36 bushels per acre. *Harvest*—Began about the usual time, but was very protracted; the crops suffered very considerably, and some were never cut; in certain places one of the worst harvests on record. *Hay*—Was lighter than usual, but of good quality; 30 to 38 cwt. per acre. *Meadow Hay*—An average crop. *Potatoes*—Generally a fair crop; dressed ware, about 7 tons per acre of good quality; little or no disease. *Turnips*—A very good crop and free from disease; in most cases braided very quickly; little resowing. *Insects*—With the exception of wireworm in places crops were fairly free from damage; beans suffered to some extent during the ripening period. *Weeds*—Not injured to any extent. *Pastures*—In the spring and early summer were very bare, but improved later in the season. *Live Stock*—Summered well, but maggots were exceedingly bad; sheep suffered to some extent through the continual striking of maggot-fly; cattle and sheep were free from disease; grass sickness still prevalent in the district amongst horses. *Clip of Wool*—Park sheep, good; hill sheep, average.

DUMFRIES DISTRICT.

DUMFRIES (Annandale). *Wheat*—A much larger acreage grown; crop fairly well harvested in most cases; quality not so good; did not thresh so well as in the previous two years; average, about 25 cwt. per acre on the most suitable land; 4 bushels per acre sown. *Barley*—Larger acreage grown; fairly well harvested; threshed much the same as last year; 2½-3 bushels per acre sown. *Oats*—A much larger acreage grown and crops rather heavier than last year and threshed out fairly well; yield, 50 bushels per acre on deep land, 30 bushels on higher fields; 4 to 6 bushels per acre sown. *Harvest*—Began about third week in August and finished second week in October; owing to badly laid crops and heavy rains the sample of grain was not so good as usual; the larger acreage and shortage of labour made the whole work very difficult. *Hay*—Ryegrass a good crop and mostly well secured; 38 to 40 cwt. per acre. *Meadow Hay*—A good crop, but not so well got owing to broken weather; 30 cwt. per acre. *Potatoes*—Scarcely so heavy as previous year's crop; digging started third week of October; weather fairly good, but labour scarce for the larger acreage; yield, 8 tons per acre. *Turnips*—Average, 18 tons per acre; quality fair; later sown crops did not braird well; return well below average; not much resowing. *Insects*—Turnip midge seemed to do some damage to the earlier crops. *Weeds*—Not any worse than usual. *Pastures*—Not so good in June owing to dry weather, but improved after the rain in early July. *Live Stock*—Did very well, especially in the late months; cattle and sheep kept free from disease. *Clip of Wool*—Good, but not so heavy as last year.

DUMFRIES (Nithsdale). *Wheat*—None grown. *Barley*—None grown. *Oats*—A fairly good crop, but laid on most farms. *Harvest*—Began in September, and on higher ground in October; on the average about two weeks late; very poor weather for late places, and much grain was damaged. *Hay*—Fairly good but not so heavy as last year; fairly well got in most cases, but weathered somewhat in ricks owing to bad stacking weather. *Meadow Hay*—A little lighter than the previous season and not well got owing to wet, sunless weather. *Potatoes*—Poorer crop than last year; in some cases below 5 tons per acre; fairly sound in spite of wet summer. *Turnips*—Slightly less than last year, but good and sound; 15 to 2½ tons per acre; braided well; no resowing. *Insects*—No trouble; pigeons

on the increase. *Weeds*—About the same amount of damage as last season owing to wet summer. *Pastures*—Not so good as last year and did not last so long; by October not much feeding value was left. *Live Stock*—Did not do so well as in previous year. Cattle and sheep were free from disease, except for trembling and tick-borne fever in lambs. *Clip of Wool*—Average quality, but light owing to bad spring.

DUMFRIES (ESKDALE). *Wheat*—None, or very little, grown. *Barley*—Very little grown. *Oats*—Good crop, but much very badly laid by wild stormy weather just before harvest, and could not be cut by binders; crops secured in good condition, threshed well, and yielded 40 to 45 bushels per acre; seed sown, 4 to 6 bushels per acre. *Harvest*—Began about the usual time, but owing to wet weather was very prolonged, and went on in some places until November. *Hay*—Ryegrass about average; not so bulky as last year, but mostly got in good condition. *Meadow Hay*—Not so productive as last year and very little got in good condition; many acres were left to rot on ground. *Potatoes*—Not so good as last year, more small tubers; there was not much disease; no new varieties were planted. *Turnips*—Crop very varied, some quite as good as last year, but in other parts the roots were small; the crop braided well; not much resowing required. *Insects*—Less damage than usual by fly; no other injury reported. *Weeds*—Were very difficult to kill owing to so much rain. *Pastures*—Average growth after first part of summer; quality good. *Live Stock*—Did well on pastures. Cattle very free from disease until autumn, when a few were found dead from an unknown cause. *Clip of Wool*—Average, quality good.

KIRKCUDBRIGHTSHIRE. *Wheat*—Acreage, though still comparatively small, was the largest in living memory; considering the backward season the yield was good. *Barley*—On many of the later farms was much spoiled by the bad harvest; when tried on farms deficient in lime it was a complete failure in some cases. *Oats*—The main cereal crop in the south-west was a bumper one, but the wet harvest wasted a good deal of it; yield excellent on early farms, 50 to 60 bushels per acre being quite common; on many of the late farms practically none secured fit for threshing. *Harvest*—Started second week in August, but cutting was very much delayed by wet weather, and crops were badly laid; the weather also accounted for much damage to grain in the stack. *Hay*—Ryegrass was only a fair crop owing to extremely dry weather in May; 30 cwt. per acre; the aftermath in August and September was excellent, clover being very plentiful. *Meadow Hay*—About an average crop, but some got rather weathered by wet spell in July; yield, 30 cwt. per acre. *Potatoes*—Larger acreage than usual grown; crop good and sound, but a wet October retarded lifting; 7 to 8 tons per acre. *Turnips*—Rather disappointing owing to lack of sunshine and excessive autumn rain; about 18 tons per acre. *Insects*—No special trouble caused. *Weeds*—Not so troublesome as in 1941 owing to dry weather in May and June. *Pastures*—Except in May and June grass was very plentiful; grazing season, owing to mild winter, extended right into December. *Live Stock*—With very much increased ploughing there was a tendency to overstock, but when there was room the grazing season was good. Cattle and sheep were comparatively free from disease. *Clip of Wool*—About average, rather better than in 1941.

WIGTOWNSHIRE. *Wheat*—Very little grown. *Barley*—Very little grown. *Oats*—Lea oats 38 to 40 bushels per acre; after green crop 42 to 44 bushels per acre; seed sown, potato oats 5 to 6 bushels per acre

broadcast, 3 to 4 bushels per acre drilled; large varieties, 5 to 7 bushels per acre; yield of straw average, but generally oats threshed well. *Harvest*—Began about the usual time, and most of the grain was cut in good order; weather broke later, and a good deal of handling of the crop was needed; with care most was secured in good order, but late crops were harvested in poor condition. *Hay*—Owing to cold, dry weather was rather light, with a want of bottom grasses and clovers; much of it was secured in good condition; yield, probably $1\frac{1}{2}$ to 2 tons per acre; aftermath generally was poor. *Meadow Hay*—About the same as usual. *Potatoes*—Earlies, 6 to 8 tons per acre, did fairly well, but owing to want of rain did not bulk so largely as usual; digging in some cases was retarded owing to want of labour and the closing of markets; late potatoes were a moderate crop of 8 tons per acre. *Turnips*—18 to 20 tons per acre; braided well; crop generally good and free from disease. *Insects*—Very little damage done. *Weeds*—Dockens a plentiful crop, with thistles a close second on some farms; redshank not so prevalent as in the previous year. *Pastures*—Retarded by the cold, late spring, and on light land were scorched in summer; stocks kept them down quite easily, with the result that there was no grass in the back-end; poorest year for pasture for a long time; little or no silage was obtained. *Live Stock*—The season was not nearly so good as 1941 for dairy cows, as in addition to weather troubles there was not the acreage under grass for dairy stock; young stock did quite well. Grass sickness is still with us, and there were some cases of navel ill as usual. Stomach trouble among young calves was fairly common, and mastitis was still a menace; sheep were fairly free from disease. *Clip of Wool*—Average.

GLASGOW DISTRICT.

AYRSHIRE. *Wheat*—Grain, 24 cwt. per acre; straw, 22 cwt. per acre; bulkier than last year, but grain was not so well filled or of such good quality; seed sown, 3 bushels per acre. *Barley*—Grain, 25 cwt. per acre; straw, 18 cwt. per acre; very little of the grain was better than of feeding standard; seed sown, 3 to $3\frac{1}{2}$ bushels per acre. *Oats*—Grain, $17\frac{1}{2}$ cwt. per acre; straw, 20 cwt. per acre; a big proportion of badly filled, light grain, and much of the crop suffered from bad harvest conditions; seed sown, $4\frac{1}{2}$ to 6 bushels per acre. *Harvest*—About a week later in beginning than for the last few years; weather very broken, which made it very protracted, in many cases till well on in November. *Hay*—33 cwt. per acre; quality generally good; more cut in the green stage to give higher feeding value; clover was not plentiful. *Meadow Hay*—25 cwt. per acre; about the same as last year. *Potatoes*—Average about 7 tons per acre; slightly better than last year; growth very slow in the spring months; disease not prevalent. *Turnips*—Average about 17 tons per acre, which was less than last year; quality not generally so good; the crop braided slowly, and took a long time to come to singling stage, but one sowing was sufficient. *Insects*—No extensive damage caused; injury to potatoes by eelworm was not so noticeable. *Weeds*—Crops not much injured, as they were kept under control in the early stages, but some got dirty before being lifted. *Pastures*—Very late growth in spring, but came on well later; clover not very plentiful, and generally pasture was not so good as last year. *Live Stock*—Did not thrive very well on grass, as the spring was cold and, later, the weather dull and wet. Sheep diseases were under reasonable control, but among dairy cattle there was much

mastitis, abortion, and sterility. *Clip of Wool*—About average; was better than last year.

BUTE. *Wheat*—None grown. *Barley*—None grown. *Oats*—Good crop; badly laid by weather. *Harvest*—Started a little earlier; weather throughout very bad; in some parts the corn could not be cut. *Hay*—Fairly good and got in very good order; about 2½ tons per acre. *Meadow Hay*—Practically none grown. *Potatoes*—Much the same as last year; about 9 tons per acre; blight came on early owing to wet season; no new varieties planted. *Turnips*—A very fair crop; about 16 tons per acre; fairly good braird; not much resowing. *Insects*—Crops injured by worms at root. *Weeds*—Turnips very much infested; much worse than usual. *Pastures*—Hardly so good as usual. *Live Stock*—Did not thrive so well as previously. There was no serious disease; a little more grass sickness. *Clip of Wool*—Bulk and quality up to usual standard.

ARRAN. *Wheat*—A small area was sown in the autumn of 1942 for the first time; results from this crop are being looked forward to with interest. *Barley*—Was also tried, and a good crop resulted, but owing to deplorable harvest weather no reliable returns could be obtained. *Oats*—Excellent crops, but the weather spoiled them completely at harvest; very few farmers were able to secure any in first-class condition. *Harvest*—Began early in August and did not finish till early in November; some fields were never cut. *Hay*—A good crop; up to 2½ tons per acre, where properly handled. *Meadow Hay*—Much the same as in former years. *Potatoes*—A good crop generally and of excellent quality, all being disposed of as seed; many of the newer varieties were grown and did well. *Turnips*—Crop good in places, but on many farms 'raan' disease very prevalent. *Insects*—No trouble recorded. *Weeds*—Crops free where properly attended to. *Pastures*—Good; better than last year where attended to; this crop much neglected and should receive more attention. *Live Stock*—Good and sound, and in excellent demand at sales; the Ayrshire herds now mostly tuberculin-tested. *Clip of Wool*—Average in quality and quantity.

LANARKSHIRE (Upper Ward). *Wheat*—Only small quantity grown. *Barley*—None grown. *Oats*—45 to 70 bushels per acre; grain and straw of fairly good quality where harvest commenced early, but in later districts both were moderate. *Harvest*—Began at usual time, but lasted much longer owing to bad weather and shortage of labour. *Hay*—1½ to 3 tons per acre; lighter crop than last year's; quality barely so good. *Meadow Hay*—A good crop, of moderate quality. *Potatoes*—5 to 8 tons per acre, a little less than last year; fairly good weather for lifting, and pitted in good condition. *Turnips*—Swedes a good crop; yellows not so good; 15 to 30 tons per acre. *Insects*—Very little damage reported. *Weeds*—Difficult to control owing to shortage of labour and wet weather. *Pastures*—Fairly good. *Live Stock*—Throve well; cattle and sheep were free from disease. *Clip of Wool*—Full average.

LANARKSHIRE (Middle and Lower Wards). *Wheat*—Yield approximately 23 cwt. of grain and 30 cwt. of straw per acre. The crop was badly laid and only moderately well secured; seed sown, English, 3 bushels, and Scotch, 4 bushels, per acre. *Barley*—None grown. *Oats*—Crop badly laid; yield less than last year—27 to 30 cwt. per acre; straw, 30 cwt. per acre; sample of grain variable. *Harvest*—Commenced in earlier districts second week of August, and in later districts

second week of September. *Hay*—Crop well secured and equal to last year, 40 to 50 cwt. per acre. *Meadow Hay*—Crop lighter than last year and quality not so good. *Potatoes*—Yield variable; generally the tonnage fell by 20 cwt. per acre; tubers much smaller in size; such varieties as *Luxury*, *Dunbar Rover*, and *Dunbar Standard* were planted. *Turnips*—Yield smaller than last year at 25 tons per acre; braided well; no second sowings required; finger-and-toe was prevalent in certain fields. *Insects*—No injury to crops recorded. *Weeds*—The labour shortage being still acute, annuals were prevalent throughout the season, especially amongst market garden crops. *Pastures*—Owing to the reduced acreage were generally better grazed, resulting in a shorter season. *Live Stock*—Both cattle and sheep on the arable pasture land did exceptionally well, but young stock grazing on secondary and moor land did not return in good condition. There was one outbreak of foot-and-mouth disease; otherwise cattle were comparatively free from disease; owing to the severe winter, however, there were heavy losses amongst hill sheep stock. *Clip of Wool*—No better than last year owing to another severe winter.

RENFREWSHIRE. *Wheat*—An excellent crop; on heavier lands 30 to 40 cwt., and on lighter lands 25 to 30 cwt., per acre; seed sown, 3 to 4 bushels per acre. *Barley*—None grown. *Oats*—A good crop; grain, 25 to 35 cwt. per acre; straw, 25 to 30 cwt. per acre; seed sown, 5 to 6 bushels per acre. *Harvest*—Commenced about 27th August, a fortnight later than previous year, and finished, on the fortunate farms, about 6th October; on many farms it was not completed until November, and much grain was lost; in the opinion of many it was worse even than the bad harvest of 1938. *Hay*—Rather under average; 1½ to 2½ tons per acre; secured in only moderate condition, due to broken weather. *Meadow Hay*—Little grown; under average and much damaged by rain. *Potatoes*—About 2 tons per acre below average yield; 8 to 9 tons per acre for second earlies (*British Queen*); main crop (*Kerr's Pink* and *Golden Wonder*), 6 to 8 tons per acre; free from disease where lifted early or sprayed, but otherwise disease was present; no new varieties reported. *Turnips*—Good, where labour was sufficient to single in time, and hoe during season; 20 to 30 tons per acre; braided well and came early to singling stage; no second sowings required. *Insects*—Except for wireworm in old pasture no great damage done. *Weeds*—More prevalent than last year, due to wet weather, increased cropping, and shortage of labour. *Pastures*—Very bare until end of May; where not too heavily grazed until then recovered well, and provided sufficient keep until December; on dairy farms, however, owing to smaller acreages of grass much pasture did not get an opportunity to recover. *Live Stock*—Throve moderately well, but few fat stock finished off on grass, owing to wet autumn and absence of artificial feeding-stuffs; no disease reported. *Clip of Wool*—Average both for quantity and quality.

ARGYLLSHIRE (Lochgilphead). *Wheat*—Practically none grown. *Barley*—Practically none grown. *Oats*—There was a good deal of late sowing, and the crop suffered extensively from weather; yield of grain not more than 25 to 30 bushels per acre; straw, about 20 cwt. per acre; seed sown, 5 to 6 bushels per acre. *Harvest*—Began about a week later than usual. *Hay*—About the same as last year, 25 cwt. per acre; quality poor owing to the wet summer. *Meadow Hay*—Less productive; much of it was never secured owing to weather. *Potatoes*—Not up to previous season; not more than 4 tons per acre; probably suffered from lack of sunshine and warmth; there was a certain amount of blight after August; no new varieties.

Turnips—Early sown swedes a good crop, but those sown later did not do so well; yield about the same as last year, 20 to 25 tons per acre; crop braided well on the whole. and there was not much resowing. *Insects*—Not much damage caused. *Weeds*—Injury not appreciable. *Pastures*—Very late in coming away, but lasted out well in the autumn. *Live Stock*—Did very well, and on the whole were free from disease. *Clip of Wool*—Average.

ARGYLLSHIRE (Kintyre). *Wheat*—Yield of grain 20 to 25 cwt. per acre; secured in good condition; seed sown, approximately $3\frac{1}{2}$ bushels per acre. *Barley*—Acreage grown similar to 1941, 19 to 21 cwt. per acre; secured in fairly good condition; weight per bushel rather lower than average; seed sown, $3\frac{1}{2}$ to 4 bushels per acre. *Oats*—Increased acreage grown; yields ranged from 14 to 28 cwt. per acre; probable average, 16 cwt.; yield of straw above average; quality variable; seed sown, about 5 bushels per acre. *Harvest*—Commenced third week in August; one of the most difficult and protracted harvests on record; a few fields of oats were not secured at all. *Hay*—About average, 30 to 35 cwt. per acre; mostly secured in good condition. *Meadow Hay*—Average yield very low; much was not secured at all owing to weather conditions. *Potatoes*—Earlies, 5 to $5\frac{1}{2}$ tons per acre; main crop lower than average, probably 5 to 6 tons per acre; blight very prevalent and appeared early in the season; one or two lots of stock seed potatoes were planted and subjected to inspection, with satisfactory results. *Turnips*—Below average, due to lack of sunshine during growing season; light crops on many farms; 15 to 16 tons per acre; crop healthy; braided well. *Insects*—Very little damage reported. *Weeds*—Poor season for control; main weeds of oat crop were charlock and docks; redshank, spurrey, and chickweed prevalent in roots, docks and ragwort in pasture land. *Pastures*—Growth rather late in commencing and no great flush of grass; maintained well on in back-end and proved most useful during late autumn. *Live Stock*—Throve fairly well after growth commenced, but grazing was none too abundant throughout the season. Cattle and sheep fairly free from disease; nothing exceptional to record. *Clip of Wool*—Fully better than previous year; quality up to average.

ARGYLLSHIRE (Islands of Islay, Jura, and Colonsay). *Wheat*—None grown. *Barley*—The few acres grown turned out a poor crop. *Oats*—Prolonged wet weather considerably spoiled the crop before harvest; yield averaged 38 bushels per acre; weight, 39 lb. per bushel; straw, of poor quality; seed sown, 5 to 6 bushels per acre. *Harvest*—Began late, about 27th August, and lasted until end of October; much of the crop badly laid and had to be cut by scythe; in most cases binders had to be replaced by reapers. *Hay*—Below average, ryegrass yielding about 1 ton per acre and clover 30 cwt. per acre. *Meadow Hay*—Less productive than last year, which was not itself good. *Potatoes*—Very poor except in sandy soils; where the land remained waterlogged tubers did not swell; despite wet weather blight was rather prevalent; yield, about 7 tons per acre; the usual varieties only planted. *Turnips*—A poor crop, although they braided well; wet weather caused blanks, and roots did not develop well; no resowing needed, but the crop lacked sunshine in July, August, and September. *Insects*—No undue damage was suffered. *Weeds*—Damage was slight and only sustained where scarcity of labour made it difficult to effect control. *Pastures*—Were of average growth and a trifle below average quality. *Live Stock*—Throve well, although growth was again late in making a start and adversely affected lambing; cattle and

sheep remained free from disease except for the usual maggot trouble in July. *Clip of Wool*—Of average quality and quantity.

STIRLING DISTRICT.

DUMBARTONSHIRE (Upper). *Wheat*—Only small acreage grown, mainly for thatch; crop fairly good and fairly well secured; yield, 30 to 35 bushels per acre; straw, 25 cwt. per acre; seed sown, 3 to 4 bushels per acre. *Barley*—None grown. *Oats*—Very late in being sown, and growth continued late throughout season; crop fairly good; earliest cut quite well saved, but later badly laid; yield, 40 to 45 bushels per acre; seed sown, 4 to 5 bushels per acre. *Harvest*—Late in commencing, and was long in being finished owing to exceptionally wet and windy weather. *Hay*—Ryegrass lighter than usual with very poor aftermath; yield, 30 cwt. per acre; quality fair. *Meadow Hay*—Very poor; in some areas crop could not be harvested. *Potatoes*—Well under last year's yield; average, 6 tons 10 cwt. per acre; disease was very prevalent from second week of August; no new varieties grown. *Turnips*—Braided well and looked exceptionally healthy throughout the season, but owing to lack of sunshine in back-end did not bulk well; crop, about 20 tons per acre. *Insects*—There was no serious trouble except from the beet-fly in the early stage of growth. *Weeds*—Damage was very extensive due to wet summer; there was no opportunity to have them killed from mid-July onwards. *Pastures*—Were of average growth throughout the latter part of the season. *Live Stock*—Did fairly well on pastures, but did not come in in quite the usual condition. Cattle and sheep were free from disease. *Clip of Wool*—Average.

DUMBARTONSHIRE (Lower). *Wheat*—Well grown and bulky, but did not ripen too well; both grain and straw soft and lacked quality; grain, 40 bushels per acre at 59 lb. per bushel; straw, 28 cwt. per acre; seed sown, 3½ bushels per acre. *Barley*—Very little grown. *Oats*—An extra heavy crop, but about 20 to 25 per cent was wasted in harvesting; quality irregular; grain, 45 bushels per acre; straw, 24 cwt. per acre; seed sown, 5½ bushels per acre. *Harvest*—A week later than usual in beginning and very prolonged owing to unfavourable weather. *Hay*—Rather heavier than last year, but the quality not so good; yield, about 2 tons per acre. *Meadow Hay*—Bulky, but the quality inferior. *Potatoes*—Did not dig so well as last season and yield not more than 6 tons per acre; disease made its appearance about mid-September, but did not seriously affect the crop; no new varieties planted. *Turnips*—An average crop, yielding about 16 tons per acre of sound roots; braided evenly, and no reseeded required. *Insects*—No appreciable damage. *Weeds*—Caused no serious damage, but owing to shortage of casual labour annuals were more in evidence in the root crops. *Pastures*—Rather bare during early summer, but made good growth later; quality not so good during autumn owing to lack of sunshine. *Live Stock*—Made only fair progress; cattle and sheep were mainly healthy except that mastitis was troublesome among back-calving cows. *Clip of Wool*—Good quality, but for the second year under average weight.

STIRLINGSHIRE (West). *Wheat*—Not much grown; grain, 15 cwt. per acre; quality poor; seed sown, 4 bushels per acre. *Barley*—None grown except a few small parcels. *Oats*—Magnificent crops gave good prospects for record yields, but after 1st August continuous wet weather reduced

the ultimate yield of grain to average of 14 cwt. per acre; quality poor; seed sown, 5 bushels per acre. *Harvest*—One week later in starting. *Hay*—Quality excellent; quantity below average. *Meadow Hay*—Less productive; below average. *Potatoes*—Average yield, 7 tons per acre; no disease; no new varieties grown; some damage by frost when harvesting. *Turnips*—Yield above average; about 25 tons per acre; quality excellent; good braird; no resowing. *Insects*—No trouble reported. *Weeds*—Land much cleaner than usual, weather being suitable during May for their destruction. *Pastures*—Very late due to cold April and May; abundant from mid-June; quality excellent. *Live Stock*—Did exceptionally well; much above average; cattle and sheep were fairly free from disease, but a great deal of mastitis in dairy cows. *Clip of Wool*—Quality good; over average.

STIRLINGSHIRE (East). *Wheat*—Yield over average on the better land; 40 to 50 bushels per acre; straw, 25 cwt. per acre; some crops on the light and poorer land were very poor; seed sown, 4 bushels per acre. *Barley*—Early crops were good; 35 bushels per acre of fair quality; later were not properly secured, and sample was disappointing; seed sown, 3 to 4 bushels per acre. *Oats*—A record crop, about 40 to 50 bushels per acre; especially good on earlier farms; later crops were somewhat spoiled by weather and some were not secured; straw, 25 cwt. per acre. *Harvest*—Began as usual in the middle of August, and to many turned out very disappointing owing to broken weather. *Hay*—Ryegrass and clover not so good as last year, 30 cwt. per acre; timothy a good crop, 3 to 4 tons per acre, green-cut; more than usual left for seed; secured in fair order. *Meadow Hay*—Not so good as in previous season, and there was great difficulty in securing it. *Potatoes*—Not up to the average, 6 to 7 tons per acre; the frosts of September retarded the Golden Wonder crop, which was about 4 tons per acre; no disease; no new varieties planted. *Turnips*—Some very good crops, up to 30 tons per acre; brairded well; no resowing. *Insects*—Crops all free from pests. *Weeds*—Charlock very prevalent, but other kinds easily checked. *Pastures*—Not so good as last year; cold week in May spoiled them for the season, and there was not sufficient for stock. *Live Stock*—Did well where grass had been manured and not overstocked. Cattle and sheep were free from disease. *Clip of Wool*—Good quality, and up to average in quantity.

CLACKMANNANSHIRE. *Wheat*—The braird was good and the crop very good, especially where sulphate of ammonia was applied in May; 40 to 48 bushels per acre; straw, 30 to 35 cwt. per acre; seed sown, 4 bushels per acre. *Barley*—A good crop; 40 to 48 bushels per acre; seed sown, 3 to 4 bushels per acre; straw, 30 to 35 cwt. per acre. *Oats*—A good crop; not so big as last year, but it thrashed well; 45 to 48 bushels per acre; weight, 40 to 42 lb. per bushel. *Harvest*—Began about the usual time, except where land was late in being ploughed. *Hay*—A good crop, 40 to 45 cwt. per acre; quality very good. *Meadow Hay*—Very little grown. *Potatoes*—Kerr's Pink, 6 to 7 tons per acre; Golden Wonder, 5 to 6 tons per acre; no disease; labour shortage hindered lifting and pitting the crop. *Turnips*—A good crop, 20 to 30 tons per acre; brairded well; no second sowing; very little finger-and-toe disease reported, owing to the increasing use of ground lime on the soil. *Insects*—Very little damage done. *Weeds*—Very little injury caused. *Pastures*—Very good indeed; where top-dressed with lime and basic slag continued good late into the season. *Live Stock*—Did very well. Cattle and sheep were free from disease. *Clip of Wool*—A fair average.

PERTH DISTRICT.

PERTHSHIRE (Central). *Wheat*—Yield good; 35 to 40 bushels per acre; straw, 24 to 30 cwt.; seed sown, 4 bushels per acre. *Barley*—Very little grown. *Oats*—Large acreage grown; yields very good, except on some poor land; 40 to 64 bushels per acre; straw, 15 to 24 cwt. per acre. *Harvest*—Started 13th August, six days earlier than last year; much time lost owing to weather conditions, but not much damage actually caused. *Hay*—An average crop mostly well got; 1 to 2 tons per acre. *Meadow Hay*—Very little got; rain spoiled most of it. *Potatoes*—On most farms not so good as last year, especially on late-planted fields; 4 to 8 tons per acre; lifting extended from 12th September till well into November; some lost through frost; shortage of labour very marked. *Turnips*—Not an average crop, but good in quality; braided well and came quickly to hoe; swedes, 18 to 24 tons per acre; yellows, 16 to 22 tons per acre; no second sowing; no disease. *Insects*—No damage reported. *Weeds*—No injury caused. *Pastures*—Good average growth. *Live Stock*—Did well. Cattle and sheep free from disease, but movement of stock was stopped owing to foot-and-mouth disease in Stirlingshire. *Clip of Wool*—Under average.

FIFESHIRE (Middle and Eastern). *Wheat*—Quantity of grain rather better than last year; grain and straw both excellent in quality; seed sown, about $3\frac{1}{2}$ bushels per acre. *Barley*—Good crop of excellent quality; 45 to 60 bushels per acre. *Oats*—Good crop of excellent quality; 50 to 80 bushels per acre. *Harvest*—Began rather later than usual; weather bad to start, but cleared later, and one of the best harvests on record was concluded in good time. *Hay*—Good crop; same as last year; about $2\frac{1}{2}$ tons per acre. *Meadow Hay*—None grown. *Potatoes*—Quite as good as last season; Majestic a good crop, free from disease. *Turnips*—Good crop, rather above average; about 25 tons per acre; braided well. *Insects*—No special injury caused. *Weeds*—Did not unduly affect growth of crops. *Pastures*—Were good throughout season. *Live Stock*—All thrive well; cattle and sheep were free from disease. *Clip of Wool*—Average.

FIFESHIRE (Western). *Wheat*—Winter wheat sown under average conditions, severe weather after sowing, and cold spell during spring thinned out the growth; some fields affected by wireworm; average crop, about 40 bushels per acre; straw average; seed sown, 3 to 4 bushels per acre. *Barley*—Several failures owing to being sown on unsuitable, lime-deficient soils; average yield, 32 to 40 bushels per acre; straw soft and light; seed sown, 4 bushels per acre. *Oats*—Average, 40 to 48 bushels per acre; samples seldom over 40 lb. per bushel; straw soft but of good feeding value; seed sown, 5 to 7 bushels per acre. *Harvest*—Started about the third week in August, general, beginning of September; weather broke at end of September, retarding completion in later districts till middle of November; owing to shortage of labour a small proportion of the crop was ruined; crops not secured early were severely damaged. *Hay*—Average return, 35 cwt. per acre; fair quality despite lack of sunshine; crop reduced by drought in early summer; early-cut crops secured in good order; others weathered and of poor quality; no second crops secured owing to weather. *Meadow Hay*—Light; some difficulty in harvesting in later districts; less generally productive than in previous year. *Potatoes*—Yields below average, 5 to 6 tons per acre; early lifting interrupted by wet weather; later districts lifted under good conditions; very few reports of disease; tubers kept well in pits. *Turnips*—Generally

a good crop and fairly sound; braided well, and there was little insect damage; no second sowing reported; average crop, 16 to 18 tons per acre. *Insects*—Crops not affected to any abnormal extent, except that sugar-beet was in many cases destroyed or badly damaged by black aphid. *Weeds*—More troublesome than usual, Redshank especially, probably owing to the cold spring, which deterred crop growth, to wet weather in late summer and autumn, and to labour shortage. *Pastures*—Generally were slow as the result of the cold spell in early summer; subsequent rain produced a flush of grass, giving strong growth and heavy aftermath. *Live Stock*—Did fairly well as a rule, but suffered to some extent in the early stages through limited pasture; some stock had to be on badly restricted grazing owing to foot-and-mouth disease restrictions. With the exception of a rather bad outbreak of foot-and-mouth disease and several cases of grass sickness in horses, stock were generally healthy; sheep maggot-fly was somewhat less troublesome than usual. *Clip of Wool*—Average.

PERTHSHIRE (Eastern). *Wheat*—Winter wheat a good crop; 40 to 50 bushels per acre; seed sown, 4 to 5 bushels per acre; samples good. *Barley*—A good crop; seed sown, 3 to 4 bushels per acre; samples good. *Oats*—A good crop; samples quite good, but inclined to be light in bushel weight owing to lack of sunshine; thrashed quite well at 42 to 68 bushels per acre; seed sown, 4 to 6 bushels per acre. *Harvest*—Began about the usual time—second week in August; was delayed by showery weather, but had fine drying winds later; finished about the end of September. *Hay*—Average crop; 40 to 50 cwt. per acre; secured in fair order. *Meadow Hay*—An average crop; quality good. *Potatoes*—A good crop, about the same as last season; some blight among early varieties; yield, 6 to 10 tons per acre; some planted late made a small return; very little disease; kept well in pits if lifted before the frost in early November; very few new varieties grown. *Turnips*—About an average crop, 30 to 35 tons per acre, but not up to last year's; grew well into autumn owing to the absence of frost; braided well; practically no resowing. *Insects*—No damage reported. *Weeds*—Caused no injury, but crops were not so well cleaned as usual owing to scarcity of casual labour. *Pastures*—Grass came away normally and gave good grazing season. *Live Stock*—Did well during season; a few cases of trouble with half-bred ewes before lambing; autumn was free from frost and cattle remained in fields until well into November, saving winter keep. Cattle and sheep were free from disease. *Clip of Wool*—Average, of good quality.

PERTHSHIRE (Western). *Wheat*—Larger acreage sown; good average crop; a few fields that thinned out during winter were resown with oats or barley; yield, 35 to 40 bushels per acre; straw, 20 to 25 cwt. per acre; seed sown, 4 bushels per acre. *Barley*—Good crop, but much of it lost by being badly laid and damaged by weather; 35 to 40 bushels per acre; seed sown, 3½ to 4 bushels per acre. *Oats*—Good yield, with many very heavy crops, but much of it laid and damaged by storms; 40 to 50 bushels per acre, with new varieties to 80 bushels; straw, poor quality; seed sown, 5 to 7 bushels per acre. *Harvest*—Began about usual time, middle of August; one of the most difficult harvests on record, caused by laid crops, very broken weather, and shortage of labour; some fields never cut and others fed direct to cattle from the stook. *Hay*—Timothy a good crop, 60 to 90 cwt. per acre, green cut; secured in good order; more left for seed on request by Agricultural Executive Committee; yield of seed not so high as usual; average, 4 cwt. per acre; ryegrass, under average,

35 cwt. on dryfield, 50 cwt. on carse. *Meadow Hay*—Average crop; not very well secured. *Potatoes*—Under average crop; 6 to 8 tons per acre; some disease, but checked by early frost; many fields were damaged by frost before lifting, and damage has been caused in the pits; no new varieties. *Turnips*—Early sown turnips did well and yielded good crops, 30 to 35 tons per acre; later sowings, retarded by the weather, were disappointing; braided well; few resowings. *Insects*—Timothy seed damaged by maggot more than usual, reducing yield of seed by one-fifth. *Weeds*—Caused no injury, but lack of labour prevented crops being cleaned as well as could be desired. *Pastures*—Up to average; grazing season lasted longer than usual owing to unusually mild weather in November. *Live Stock*—Did well; cattle and sheep were free from disease. *Clip of Wool*—Average quality and crop.

PERTHSHIRE (Highland). *Wheat*—Not generally sown; only a few acres on favoured farms. *Barley*—A good crop; more sown than usual; yield, about 40 bushels per acre; seed sown, 4 bushels per acre. *Oats*—Increased acreage sown; straw of good bulk and quality; natural weight of grain about 42 lb. per bushel; seed sown, 6 to 8 bushels per acre, according to variety. *Harvest*—Began in third week of August, and in most cases was completed within five weeks, under fine weather conditions. *Hay*—Crop average, of good quality and well secured; 35 cwt. per acre. *Meadow Hay*—An average crop but not well got, owing to weather conditions. *Potatoes*—Larger acreage than usual planted, and a good crop secured in time under generally favourable conditions, notwithstanding shortage of labour; yield, slightly under average, about 7 tons per acre; little disease and no new varieties grown. *Turnips*—Very similar to the previous season; braided well and quickly; no second sowing required; average yield, 20 tons per acre. *Insects*—No damage recorded. *Weeds*—Very few, and where evident were easily kept under control. *Pastures*—A good grazing season which lasted well into autumn. *Live Stock*—Throve well; cattle and sheep free from disease; several isolated cases of grass sickness amongst horses. *Clip of Wool*—Good quality, and about an average crop.

ABERDEEN DISTRICT.

ANGUS (Western). *Wheat*—34 bushels per acre; straw and grain good quality; seed sown, 3 to 4 bushels per acre, drilled. *Barley*—44 bushels per acre; straw and grain good quality; seed sown, 2½ to 4 bushels per acre, drilled. *Oats*—54 bushels per acre; straw and grain good quality, in spite of lots having been badly laid; seed sown, 4 to 6 bushels per acre, according to variety and district. *Harvest*—Began about the third week in August in very broken weather which later cleared; leading was carried through without a hitch. *Hay*—2 tons per acre; good quality. *Meadow Hay*—None grown. *Potatoes*—5 to 6 tons per acre; shaws went off early with blight in August, but tubers were not affected, and very little disease reported in dressing; no new varieties tried; frost did considerable damage about the end of October. *Turnips*—20 tons per acre; good braird and no resowing required; some crops went off badly a month after thinning, and seemed to stop growing temporarily, probably owing to unseasonable weather and lack of sun. *Insects*—Crops not damaged more than usual. *Weeds*—Caused no greater injury than usual. *Pastures*—Were equal in growth and quality to last season's average. *Live Stock*—Throve well, and kept free from disease. *Clip of Wool*—Good quality, but under average for crop.

ANGUS (Eastern). *Wheat*—Good crop, well secured, 44 to 52 bushels per acre; straw, of average quantity, stood up well; tendency has been to sow more red than white wheat; seed sown, $3\frac{1}{2}$ to 4 bushels per acre. *Barley*—Satisfactory, 48 to 64 bushels per acre; samples good in spite of somewhat sunless summer; straw did not stand up too well, but colour was not much affected; seed sown, $3\frac{1}{2}$ bushels per acre usually. *Oats*—Grain not so heavy per bushel as usual, but 80 to 96 bushels per acre were taken from the best land; straw, plentiful and of good quality; seed sown, 5 to 6 bushels per acre of new, thick-skinned varieties. *Harvest*—Began about the same time as last season, 15th August; with favourable weather the crops, mostly stacked in fields, were gathered in record time and in very good condition. *Hay*—A good average crop in the coastal districts; fully 3 tons per acre, well mixed with clover and secured in prime order; there has seldom been a better result. *Meadow Hay*—None grown. *Potatoes*—Yield not more than $7\frac{1}{2}$ to 8 tons per acre, some 30 to 40 cwt. less than last year's except on the best farms; there was little disease except in early varieties and King Edward. *Turnips*—Swedes varied unaccountably from 20 to 30 tons per acre; some crops on good land suffered somewhat from finger-and-toe and dry-rot; late-sown yellows better than usual; the braird was slow in places, but very little second sowing necessary. *Insects*—Not much damage caused. *Weeds*—Owing to labour shortage and pressure of hay-making got somewhat out of control; sun-weeds and couch-grass did most harm. *Pastures*—Came early in spring, were good and abundant all through the season where the land was in good heart, and lasted well into autumn. *Live Stock*—Did well, and were healthy throughout the whole season; there were a good many cases of grass sickness among horses. *Clip of Wool*—Slightly under average both in quality and quantity.

KINCARDINESHIRE. *Wheat*—34 bushels per acre; grain and straw good quality, but did not thresh well; seed sown, drilled, 3 to 4 bushels per acre. *Barley*—38 bushels per acre; grain and straw good quality, but did not thresh to expectation; seed sown, 3 to 4 bushels per acre. *Oats*—50 bushels per acre; grain and straw good quality, but did not thresh so well as last year; seed sown, 4 to 8 bushels per acre. *Harvest*—Started in first week of September and continued till second week in October. *Hay*—Poor crop, 35 cwt. per acre. *Meadow Hay*—None grown. *Potatoes*—Not so good as last season; $6\frac{1}{2}$ tons per acre. *Turnips*—Quite good; 18 tons per acre; some had to be resown owing to frost. *Insects*—No damage done. *Weeds*—No injury reported. *Pastures*—Average growth. *Live Stock*—Grazed well and made average progress; there was little or no complaint of disease. *Clip of Wool*—Average.

ABERDEENSHIRE (Buchan). *Wheat*—Very little grown. *Barley*—Average, 40 bushels per acre. *Oats*—Very variable returns, 40 to 80 bushels per acre. *Harvest*—Began about end of August in early districts. *Hay*—Similar to last year; from 30 to 40 cwt. per acre. *Meadow Hay*—None grown. *Potatoes*—From 5 to 8 tons per acre; very little disease. *Turnips*—Good crop; better than last year; 15 to 25 tons per acre; braided well; no resowing. *Insects*—No serious damage. *Weeds*—No damage reported. *Pastures*—Quite as good as last year, but later in starting. *Live Stock*—Did well. Cattle and sheep were free from disease. *Clip of Wool*—Average.

ABERDEENSHIRE (Central). *Wheat*—Much the same as last year; good quality; 16 to 20 cwt. per acre; straw good. *Barley*—18 cwt. per

acre; quality generally good; weight, 52 to 56 lb. per bushel. *Oats*—15 to 20 cwt. per acre; quality moderate; bushel weight, 38 to 44 lb.; straw medium. *Harvest*—Commenced about a week later than last year; the weather varied, and the higher-lying farms were not secured till November. *Hay*—Poor crop; quality medium. *Meadow Hay*—Rather poorer than last year. *Potatoes*—About 6 tons per acre; quality good but yield distinctly less than last season; ware potatoes mostly Kerr's Pink, but considerable areas planted in varieties suitable for English seed market. *Turnips*—Fairly good; above the average; no second sowing required. *Insects*—No damage was done. *Weeds*—Damage average, mostly from surface varieties. *Pastures*—Below the average; a short growing season and the yield decidedly less than last year. *Live Stock*—Did fairly well, but most of the pasture land was overstocked due to the increased acreage cropped; milk yields were difficult to maintain, even to the average. Both cattle and sheep have been free from disease. *Clip of Wool*—Much poorer both in quality and quantity.

ABERDEENSHIRE (Strathbogie). *Wheat*—None grown. *Barley*—Average quantity grown; crops good; yield, 32 to 40 bushels per acre, weighing 52 to 56 lb. per bushel; seed sown, 4 bushels per acre. *Oats*—In some parts crops were slightly better than in 1941 and in others not so good; in early districts well harvested, but later crops only fair; yield, slightly below average, 36 to 48 bushels per acre, weighing 38 to 42 lb. per bushel. *Harvest*—Crops well harvested in early parts, but in later districts weather broke and made harvesting very protracted; there was an abundant supply of straw, mostly of good quality. *Hay*—Not much grown; there would be a market for more. *Meadow Hay*—None grown. *Potatoes*—Quality good, but quantity below average; no new varieties grown; staple crops—Kerr's Pink and Golden Wonder. *Turnips*—Crop satisfactory, and no resowing was necessary. *Insects*—No trouble reported. *Weeds*—Little trouble caused considering the shortage of labour; weather was favourable for cleaning the land. *Pastures*—Fair, abundant up to August, but went off quickly afterwards. *Live Stock*—Did well on pasture; cattle and sheep were free from disease. *Clip of Wool*—Quality and quantity average. *General*—Snow on ground until well into sowing season; weather exceptionally dry until hay season, when rain fell almost daily; harvest was favoured with good weather to start, but the weather broke in some districts when the stacks were newly built and in others before leading was half finished, much damage resulting.

BANFFSHIRE (Lower). *Wheat*—None grown. *Barley*—Above average; 44 bushels per acre; well harvested; bushel weight, 56 to 58 lb.; straw, 20 cwt. per acre, of good quality; seed sown, 4 bushels per acre. *Oats*—A good crop, especially of the later varieties, such as 'Victory'; yield, 56 bushels per acre; straw, of fine quality; about 28 to 30 cwt. per acre; seed sown, 6 to 7 bushels per acre. *Harvest*—Began at the usual time and lasted about a month only. *Hay*—A very short crop owing to the long spell of dry weather; yielded only 20 to 30 cwt. per acre. *Meadow Hay*—None grown. *Potatoes*—Better than last year; yield, 8 to 10 tons per acre; no disease; no new varieties planted. *Turnips*—Better yield than last season all over and of better quality; about 18 to 20 tons per acre; on heavy land there was some second sowing owing to the very dry weather. *Insects*—No damage caused. *Weeds*—No injury reported. *Pastures*—Growth poor owing to dry weather, but quality good. *Live Stock*—Did fairly well; cattle and sheep were free from disease. *Clip of Wool*—Was well up to average.

BANFESHIRE (Upper). *Wheat*—None grown. *Barley*—Only an acre or so grown for feeding purposes. *Oats*—Slightly lighter than last year's crop; 40 to 45 bushels per acre; bushel weight barely standard. *Harvest*—Commenced second week in September, about a fortnight later than usual; cutting very difficult owing to broken-down and tangled nature of the crop. *Hay*—Similar to last year; about 2 tons per acre. *Meadow Hay*—None grown. *Potatoes*—Bumper crop, free from disease; main crop, Kerr's Pink. *Turnips*—Quite a full crop of healthy bulbs, 17 to 20 tons per acre; no trouble in brairding, and no second sowings. *Insects*—No damage of any consequence. *Weeds*—Some ground filthy due to yavelling, knot-grass, and some of the less harmful stringy type of weeds. *Pastures*—Under average, but came stronger after mid-summer. *Live Stock*—Did fairly well; no disease among cattle; lambs treated for dysentery by injection as in last year. *Clip of Wool*—About average; considerably better than last year's.

INVERNESS DISTRICT.

MORAYSHIRE. *Wheat*—A good crop, rather better than last year's; 43 bushels per acre; straw, 33 cwt. per acre, both good quality. *Barley*—A fair crop; 35 bushels per acre, weighing 53 to 57 lb. per bushel; straw, good quality, 22 cwt. per acre; seed sown, 3 to 4 bushels per acre. *Oats*—A good crop, but not up to last year's; 80 bushels per acre on the best land; uplands, 26 to 42 bushels per acre, quality fair; straw, 25 cwt. per acre of good quality; seed sown, 4 to 7 bushels per acre according to variety and mode of sowing. *Harvest*—Started about same time as last year; all secured in good condition in the earlier districts; on higher land, owing to shortage of labour and bad weather, considerable damage was done. *Hay*—Fair in the low country, up to 50 cwt. per acre; not much grown in the uplands; yield about 25 to 30 cwt. per acre; good quality and most secured in good condition. *Meadow Hay*—None grown. *Potatoes*—Not so good as last year; 6 to 7 tons per acre; quality good; no new varieties, and very little disease reported. *Turnips*—Much the same as last year; 15 to 30 tons per acre; good quality; in the absence of severe frost they kept well; little resowing. *Insects*—No damage reported. *Weeds*—Not more than usually troublesome where sufficient labour could be employed. *Pastures*—Average growth. *Live stock*—Did very well; cattle and sheep were free from disease. *Clip of Wool*—Average quality, but crop rather light.

NAIRNESHIRE. *Wheat*—Little grown. *Barley*—36 bushels per acre; seed sown, broadcast, $3\frac{1}{2}$ to 4 bushels; drilled, 2 to 3 bushels per acre. *Oats*—52 bushels per acre; seed sown, 6 to 7 bushels per acre. *Harvest*—Began at usual time. *Hay*—Much the same as last year; about 1 ton per acre. *Meadow Hay*—None grown. *Potatoes*— $7\frac{1}{2}$ tons per acre; no disease. *Turnips*—Average yield; no second sowing. *Insects*—No damage done. *Weeds*—No injury caused. *Pastures*—Less than last year. *Live Stock*—Did well, and were free from disease. *Clip of Wool*—Average.

INVERNESS-SHIRE (Inverness). *Wheat*—46 bushels per acre; seed sown, 4 bushels per acre. *Barley*—32 bushels per acre; seed sown, $3\frac{1}{2}$ bushels per acre. *Oats*—32 bushels per acre; seed sown, 7 bushels per acre. *Harvest*—Began ten days later than usual. *Hay*—Under average; secured in good condition. *Meadow Hay*—Poor crop; secured in bad condition. *Potatoes*—Same as last season, about $4\frac{1}{2}$ tons per acre. *Turnips*—Good crop;

not so heavy as last year's. *Insects*—No trouble experienced. *Weeds*—Increased owing to shortage of labour. *Pastures*—Average growth and quality. *Live Stock*—Throve well; cattle and sheep were free from disease. *Clip of Wool*—Quality good; crop up to average.

INVERNESS-SHIRE (Skye). *Wheat*—None grown. *Barley*—None grown. *Oats*—Very poor, being very deficient in quantity and quality; straw about the usual bulk; April and May were very dry and the rest of the season very wet. *Harvest*—Began later than usual, 10th of September, and took a long time to finish, about the end of October; the worst harvest for years. *Hay*—Ryegrass and clover not heavy, and scarcely any secured in good condition owing to the continuous rains. *Meadow Hay*—Of good bulk on productive soils, but none of it was secured in good condition, and a large portion was not cut or never reached the stack. *Potatoes*—Disappointing; looked quite promising in July, but were damaged by the strong winds in August; result, a small crop of inferior quality. *Turnips*—Small acreage grown; yield, fairly good, but the land does not produce such sound crops as previously, possibly owing to lack of lime; on suitable land the return was satisfactory. *Insects*—Crops not much injured. There was another pest in autumn, great numbers of birds picking the grain from the uncut oats; they did much damage in some places. *Weeds*—Same damage as usual; they were worse on the wetter parts. *Pastures*—Not quite so good as last year, especially in the back-end of the season. *Live Stock*—Throve fairly well, but were not so good as last season in some places. From April to June there were some sickness and deaths among young cattle and young sheep, but losses were not at all heavy. *Clip of Wool*—A little heavier than last year's.

INVERNESS-SHIRE (Lochaber). *Wheat*—None grown. *Barley*—None grown. *Oats*—A fair average crop of straw with grain very light. *Harvest*—In most cases was late due to a long period of broken weather, but it was secured in fairly good order about a month later than usual. *Hay*—Well below average owing to cold dry weather during April, May, and first half of June. *Meadow Hay*—Less productive for same reason. *Potatoes*—Crop light; under average; kept well, with no appearance of disease. *Turnips*—Very few grown, but those who had them sown before end of May had a good crop which kept well right through the winter. *Insects*—The damage was very small. *Weeds*—Crops very free owing to dry spell early in season, when every opportunity was given for cleaning ground properly. *Pastures*—Very good; an improvement on last year. *Live Stock*—Did well; cattle and sheep were free from disease; there was very little trouble from Maggot Fly. *Clip of Wool*—Light; under average due to exceptional drought during May and early part of June.

ROSS-SHIRE (Dingwall and Munlochy). *Wheat*—A good crop; more grown and yield better than average; straw good; seed sown, 3 to 4 bushels per acre. *Barley*—A good crop; larger acreage grown; 32 to 52 bushels per acre; straw good; seed sown, 2½ to 4 bushels per acre. *Oats*—A very good crop; larger acreage grown; grain not so well filled as last year; yield disappointing on light and late-ploughed land; straw, good quality when well got. *Harvest*—Generally ten days later than last year and very prolonged owing to shortage of labour. *Hay*—A good crop and generally well got; yield, 30 to 40 cwt. per acre on the best land; not so much grown. *Meadow Hay*—Practically none grown. *Potatoes*—Larger acreage grown; yield per acre slightly less than last year; quality excellent, and little sign of disease. *Turnips*—Crop was good, and with

the open back-end late-sown crops kept growing and yielded a good bulk ; very little resowing. *Insects*—No report of damage, but crows and wood-pigeons appear to have increased and to have caused considerable trouble. *Weeds*—On some farms the damage increased, probably owing to labour scarcity. *Pastures*—Showed average growth. *Live Stock*—Throve well ; cattle and sheep free from disease. *Clip of Wool*—Average.

ROSS-SHIRE (Tain, Cromarty, and Invergordon). *Wheat*—Generally not a good crop ; spring wheat not good. *Barley*—On suitable land up to 56 bushels per acre ; generally a satisfactory crop ; straw, not heavy. *Oats*—On good land up to 64 bushels per acre ; on poorer land down to 24 bushels per acre. *Harvest*—Began about usual time ; on the whole the weather kept up until towards the end of a very prolonged harvest. *Hay*—A fair crop ; harvested in good condition. *Meadow Hay*—None grown. *Potatoes*—6 to 7 tons per acre ; little disease ; usual well-known sorts grown ; an increase in acreage of Gladstone. *Turnips*—An average crop ; little or no second sowing ; grew well during back-end. *Insects*—Very slight trouble caused. *Weeds*—Kept down fairly well, except on light cross-cropped land. *Pastures*—Grazed well. *Live Stock*—Did well ; kept free from disease. *Clip of Wool*—Over average.

SUTHERLANDSHIRE. *Wheat*—None sown. *Barley*—34 bushels per acre ; straw, 18 cwt. per acre ; seed sown, about 4 bushels per acre ; a good crop of grain ; straw of good quality. *Oats*—36 bushels per acre ; straw, 20 cwt. per acre ; seed sown, about 4 bushels per acre ; a heavy crop on early farms secured in good condition, but on high, poor land quality of grain and straw was poor. *Harvest*—Began about the usual time. *Hay*—About 18 cwt. per acre ; quality was better than last year where crop was secured early. *Meadow Hay*—Less productive than last season ; about 12 cwt. per acre ; quality poor owing to bad weather. *Potatoes*—About 4 tons per acre ; a very much lighter crop than last year's, with very small tubers ; no disease ; some 'Pilot' were planted and did very well. *Turnips*—About 14 to 17 tons per acre ; a very much lighter crop than the previous season's ; braided quite well ; no second sowing, but wet weather spoiled the crop. *Insects*—Caused no damage. *Weeds*—There was no great damage. *Pastures*—Improved later in the season, and in the back-end were good. *Live Stock*—Cattle and sheep did well and hill ewes were specially good at October dippings. Cattle and sheep were very free from disease except for some foot-rot in sheep on park land. *Clip of Wool*—Quality was very good ; crop just about average.

CAITHNESS-SHIRE. *Wheat*—Small acreage grown ; an average crop ; yield, 60 bushels per acre ; grain and straw, good quality ; seed sown, 4 bushels per acre. *Barley*—Similar to last year ; yield, 44 bushels per acre ; grain and straw, average quality ; seed sown, 4 bushels per acre. *Oats*—Crops were heavy ; many fields laid ; grain and straw, good quality ; have not threshed out so well as last year ; 36 to 40 bushels per acre ; straw, 2 tons per acre ; seed sown, 4 to 5 bushels per acre ; late-sown fields did not ripen and were cut green in November. *Harvest*—Began a week later than last year ; cutting was general in the first week of September. *Hay*—A good crop, equal to last year's in quantity ; 2 to 3 tons per acre ; quality inferior ; partly spoiled by rain after cutting, and stacked in bad condition. *Meadow Hay*—Equal to last year, but much of it spoiled by unfavourable weather. *Potatoes*—About half the crop of last year ; 3 to 4 tons per acre ; evidence of disease about the middle of August ; not many new varieties planted. *Turnips*—Average crop ; 25 to 28 tons

per acre; braided well; no resowing necessary. *Insects*—Practically no damage done. *Weeds*—Charlock prevalent in corn crops; thistles abundant in pastures; spurrey and sorrel infested the poorer types of soil; damage not greater than usual. *Pastures*—Of average growth and quality with last year. *Live Stock*—Throve well on pastures; cattle and sheep were free from disease. *Clip of Wool*—Average and of good quality.

ORKNEY. *Wheat*—None grown. *Barley*—Grain, 30 to 40 bushels per acre; straw, 25 to 30 cwt. per acre; both similar to last season; seed sown, 3 to 3½ bushels per acre. *Oats*—Grain varied very considerably according to damage done during harvest; 30 to 60 bushels per acre; bushel weight, 34 to 41 lb.; seed sown, 4 to 5 bushels, and for large grain varieties, 6 to 7 bushels per acre. *Harvest*—In most districts commenced about a week later than usual. *Hay*—Crop average; 30 to 40 cwt. per acre. *Meadow Hay*—Average yield. *Potatoes*—Average, generally lower than last year; 5 to 6 tons per acre; no reports of serious reduction due to disease, but owing to the very wet season the quality was poor. *Turnips*—Very satisfactory in most districts; yield about average; no cases of resowing reported. *Insects*—No damage reported. *Weeds*—No serious damage recorded. *Pastures*—Abundant throughout the season. *Live Stock*—Made satisfactory progress; cattle and sheep were free from disease. *Clip of Wool*—About average.

SHETLAND. *Wheat*—None grown. *Bere*—9 to 10 cwt. per acre; quality of grain and straw below average; seed sown, 3½ to 4 bushels per acre. *Oats*—8 cwt. per acre; both grain and straw below average in yield and quality; seed sown, 4 to 6 bushels per acre. *Harvest*—Commencement was 7 to 10 days later than usual in the case of bere and 14 days in the case of oats. *Hay*—Yield of 'seeds hay' 18 to 20 cwt. per acre; ryegrass and clover yields and quality, average or slightly below. *Meadow Hay*—Well below average; ruined in some cases by weather conditions. *Potatoes*—Yield below average, 5 to 5½ tons per acre; quality fairly good; no serious attack of disease. *Turnips*—13 tons per acre, quality good; braird was slow, though resowing unnecessary. *Insects*—Damage caused by cabbage-root fly fairly widespread though better controlled; injury done by carrot-root fly about average; leather-jackets slightly more troublesome than last season. *Weeds*—Charlock in oats prevalent, as were shepherd's purse and spurrey; thistles and docks also troublesome. *Pastures*—Good, similar to last year; fairly long grazing season. *Live Stock*—Generally did well; very little disease among cattle and sheep. *Clip of Wool*—Quality, moderately good; yield, slightly below average, similar to last year; prices for Shetland wools: moorit, 3s. 3d.; white, 3s.; black and grey, 2s. 6d. per lb.; Cheviot (within Shetland), 2s. 6d. per lb.

THE WEATHER OF SCOTLAND IN 1942.

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THIS report consists of (1) a general description of the weather from month to month, and (2) a selection of rainfall returns in which each county of Scotland is represented by one or more stations. Temperature readings, unless otherwise stated, are from thermometers exposed in the regulation "Stevenson Screen."

JANUARY.

The month was very cold and dull, but did not touch the extremes of temperature of the previous two Januaries. There were heavy snowstorms, which caused much dislocation of traffic in the second fortnight.

Mean temperatures were much below average in all districts. Though not so low as in 1940 and 1941, they were lower than those of any other year since 1900. The second week was the coldest period of the month, but there were also three specially cold spells of two or three days between the 21st and the 31st. Braemar recorded 8° F. (24 degrees of frost) on the 14th, Balmoral 9° on the 11th, and Tarland 11° on the 12th. In the south and centre there was hard frost throughout the twenty-four hours on the 21st, and at Hawick the maximum for the day was 24° F. Ground frosts occurred every night in one place or another, the severest being at Braemar on the 14th, when the ground minimum was 5° F. There was a brief spell of mild weather during the first few days, and in this most places experienced temperatures of about 50° F. The highest readings were 56° at Balfron and 55° at Stonehaven on the 3rd.

The month's total precipitation was above average in most parts, and much of it was snow. Many places in the east and south-east had more than double their usual amount. On the other hand, in a large area of the north-west and the Grampians totals were below average. Snowstorms on the 19th-20th were severe, especially in the north. A train was stranded in Caithness and roads were blocked over much of the country. Many places had 1½ to 2 feet of undrifted snow.

Sunshine was in general scanty. The east and south-east, for example, had 30 to 40 hours less than usual. Only at a few places, chiefly in western parts, was sunshine up to or slightly over normal.

FEBRUARY.

This month, the coldest February since 1900, was a degree colder than January, and about 3 degrees colder than February in 1940 and 1941. There was heavy snowfall in the first week, but not much thereafter.

Mean temperature was more than 5 degrees below average, a result of the persistence as well as of the severity of the cold weather. Temperature nowhere reached 50° F. during the month—a record for 80 years. The east and south were affected most severely, some places there being 7 degrees below their average. Outstanding minimum temperatures were 5° F. at Braemar and 9° F. at Peebles during the specially cold nights of the fourth week. Ground frosts occurred every night and were severe in parts, the lowest temperatures on the ground being 4° F. at Braemar (28 degrees of frost) and 6° F. at Onich. The highest day temperature was 49° F. It occurred at a few places in the islands during the course of the first nine days, and at one or two mainland stations such as Gordon Castle and Kilmarnock on the 15th and 20th.

Precipitation was mostly below average, though a few widely separated places in the east were rather above average. Some stations in the west and south had less than half their usual amount. Most of the snow fell in the first week, and traffic was again dislocated, especially in the north-east. There was much drifting both there and elsewhere; in the vicinity of Kelso, for example, 18-foot drifts were reported.

Sunshine totals were again small in most parts. There were, however, a few places in both the east and the west which were more favoured. The worst area was the Clyde Basin with only about 30 hours. Turnberry, on the other hand, had 87 hours—26 above the average—and the coast from Dundee to Stonehaven had about 80 hours.

MARCH.

The lowest temperature of the winter occurred in the second week, and the month generally was rather cold and dull. As in February, much snow fell during the first week, but relatively little thereafter.

Mean temperature was about 1½ degrees below average. The only moderately warm days were the 23rd, 24th, and 31st. On each of these a number of places had shade temperatures of 60° F. The highest reading was 63° F. at Stonehaven on the 24th. There was a specially cold spell with sharp frost from the 6th to the 12th, the lowest temperatures for the whole winter being recorded on the 8th. Braemar on this morning had a reading of 3 degrees below zero (35 degrees of frost). Ground frosts occurred on all but three nights, the lowest ground temperature being 6 degrees below zero on the 8th at Braemar.

The month's precipitation was relatively small in most parts. North of a line from Oban to Aberdeen stations in general received under half their usual amount. The Solway had somewhat above its average, and the Clyde, along with a few districts inland, reached their averages. There were wet spells from the 3rd to the 8th, 13th to 20th, and 29th to 31st, so that although the totals were not large, wet days were rather frequent. Snowfall was widespread and in places heavy from the 4th to the 7th. Perth had about 10 inches of level snow, and there was a good deal on Deeside.

Sunshine was poor, especially on the east coast and in the north and north-west. Many stations were 30 or 40 hours below their averages, and Stornoway had only 56 hours—52 short of its usual total. On the other hand, Tiree, the Ayrshire coast, and Nairn had over 100 hours.

APRIL.

April interrupted the sequence of dull cold months, and the weather was brilliant at times. Some sunshine totals broke records, and though there were cold easterly winds the month as a whole was warmer than usual.

Mean temperature for the whole country was nearly 2 degrees above the average. The excess varied from less than a degree in Fife to about 3 degrees in Ayrshire and parts of the north. On the warmest days (the 16th and 17th) 70° F. was reached in many places. The highest reading reported was 73° F. at Dumfries, Stirling, Tarland, and elsewhere on the 16th, and at Onich on the 17th. Later in the month conditions became colder, and during the last week night frosts were widespread. Even on the 18th, only two days after its warmest day, Tarland had a minimum of 21° F. Balmoral reported 21° F. likewise on the 30th. Ground frosts occurred on 25 nights, the lowest temperature recorded being 12° F. at Balmoral on the 27th.

Rainfall was general and fairly heavy until the 9th, but the rest of the month was notably dry. From the 10th to the 30th many places in Wigtown and Ayrshire had a drought. Elsewhere the drought was interrupted by light rain between the 21st and the 23rd. Most of the mainland stations north-west of the Great Glen and also those in the islands had barely half their normal amounts. On the other hand, despite the dry spells, a good deal of country between Moray and the Solway had rather more than its average rainfall. Light snow fell on the hills from time to time.

The month was the sunniest April for many years, and approached the figures of June 1939 and 1940. Turnberry, the Moray coast, and Skye had over 230 hours—that is, about 100 hours above the average; and Kirkwall, with 220, surpassed the total of any April since the year 1880, in which observations began. Everywhere the excess over the average was at least 35 hours.

MAY.

Sunny weather persisted in May, though not quite to the same extent as in April. The second fortnight had frequent rainfall, which brought the totals up to about the average generally.

Mean temperature over all was practically normal, the northern half of the country being rather warm and the south rather cool. Warm spells occurred from the 1st to the 4th and the 14th to the 17th, temperatures of 70° F. being recorded at a few places in both periods. The highest readings were 71° F. in Edinburgh (Liberton) on the 15th, and 70 at Kilmarnock and elsewhere on the 2nd and the 16th respectively. Sharp frosts for the time of year occurred at the beginning of the month and again from the 8th to the 10th, Peebles having a minimum of 23° F. on the 1st and Braemar 20° F. on the 8th. Ground frosts were reported on 23 nights. All districts experienced them during the clear cold nights following the warm days of the 1st to the 4th, and they were fairly widespread in the later cold spell. At Balmoral temperature on the ground fell to 12° F. on the 9th.

The dry weather of April lasted through the first fortnight of May in most parts. Kilmarnock had a 34 days' drought from the 11th April to the 14th May, and at other places in the south-west this drought was only broken by light rain on 22nd or 23rd April. Rainfall was sufficiently frequent in the second half of the month to give totals above the average south of the Great Glen. The figures remained below average, however, in the north-west, the Firth of Forth area, and on the Ayrshire coast.

The only place with deficient sunshine in May was Shetland. Many widely separated places had over 250 hours: an excess of more than 70 hours for a number of them. Tiree had 282 hours; Arbroath, 262; and Duntuilum (Skye), 258. Only a few places had less than 200 hours.

JUNE.

After the bright April and May there was a reversion to dull weather in June, with more than the usual rainfall in the west and north-west. Snow fell in the hills during the second week.

Mean temperature was slightly above average in the east and slightly below average in the west; some places, however, had as much as 2 degrees excess and others 3 degrees deficit. The warmest weather of the year was experienced from the 3rd to the 6th, shade temperatures on the 5th and the 6th reaching 80° F. at many stations. The highest readings recorded were 82° at Peebles and 81 at Dumfries. On the coolest days (1st, 11th, 12th, 16th) there were slight night frosts (31° F.) at a number of high-level stations. Ground frosts occurred on 12 nights, the lowest ground temperature being 24° F. at Onich on the 1st.

Really wet days were few in June and rainfall totals mostly low. Some places in the east and south-east had under half their

average. North-west of the Great Glen, however, falls were much heavier; Loch More, for example, had an excess of over 80 per cent. There were six days with falls of 1 or 2 inches in that area.

Sunshine was well below average in most places, and especially so in the north-west. In Fife and the southern parts of the country, however, the shortage was relatively small. Totals there reached from 180 to nearly 200 hours, whereas the Stornoway total of 92 hours (75 hours below average) was the lowest for any June since 1881.

JULY.

The month was showery with a dearth of sunshine in the west and north, but brighter weather in the east and south.

Mean temperature for the whole country was about half a degree below the average. Locally in Ross-shire the deficit was as much as 3 degrees. On the other hand, in places along the east coast there was a slight excess. Temperature rose well above 70° F. on 2nd, 20th, and 31st at many places in the east and south. The highest reading was 78 degrees at Peebles on the 2nd, but a number of stations had 77 or 76 degrees on this and the other warm days. Western districts were rather cool; for example, at Duntuilim (Skye) the highest reading from the 6th to the 29th was 60 degrees. Night temperatures were low on the 3rd, 11th-12th, and 27th-28th, minimum readings of 40 to 45 being numerous. Several stations in hill districts had 36° F. on the 12th, 27th and 28th, and there were six nights with slight ground frost at high-level stations.

Rainfall of a showery type was experienced throughout the month, but the amounts were not excessive. On the whole, the totals exceeded the average west of the line from John o' Groats to Wigtown Bay and were below it east of this line, although a few places to the east had more than usual as a result of local thunderstorms. There were about 16 rain-days in the east and 25 or more in the west. The only very wet day in the east was the 16th, but in the west there were four days on which a few stations had more than 2 inches.

Sunshine totals were above normal over most of the east and south, despite the showery weather. Leuchars and Marchmont had 205 and 200 hours respectively and a number of stations over 190. Even in the west country Tiree had 191 hours, but records were mainly poor in the west and north; Fort Augustus reported only 93 hours.

AUGUST.

August was dull throughout, and persistent heavy rain fell in the west.

The mean temperature of the month for the country as a whole was about 1½ degrees above the average, although there were some cool days. The warmest days were the 1st with temperatures above 70 degrees in most districts, and the 28th with temperatures

above 80 at a few Border stations. On the latter day Ruthwell reported 82 degrees, and several other places in the area extending from Kelso and Marchmont to Tongland (Kirkcudbright) had 80 degrees or over. From the 4th to the 6th there was a cool spell, during which night temperatures of 40 to 45 degrees were widespread. High-level stations had temperatures down to 36 at this time. Slight ground frosts occurred in places on four nights.

There were a few days without rain early in the month and again from the 26th to the 28th, but apart from these the month was dull and wet everywhere except on the east coast. Argyll and the West Highlands had rain every day from the 6th to the 21st, and Fort William recorded a little over 9 inches in the course of the month, the greatest amount in August for thirty-five years. Daily falls exceeding an inch were numerous in the west during the period 7th to 21st; at Glenmoidart and Kinlochourn more than 3 inches in a day were recorded. The eastern parts of the country had their wettest day on the 10th, a few falls of over an inch being recorded on that day.

Weather was exceptionally dull nearly everywhere, many stations having their dullest August on record. Eskdalemuir had only 58 hours, and Stornoway's August total of 65 (like that of June) was the lowest since 1881. Only a few stations in the east had over 110 hours.

SEPTEMBER.

Relatively to its average this month was very wet. Nevertheless there was a good deal of sunshine in parts, and the weather was not cooler than usual. The hills had their first autumn snow on the 24th.

Mean temperature for the country as a whole was 0.3 degree above normal, the first half of the month being rather warm and the second rather cool. On the 8th, which was the warmest day, most districts reported readings of 65 degrees and over. The highest readings were in East Aberdeenshire, where some stations reported 75 and 78 degrees. Towards the end of the month, from the 25th to the 27th, there was a cool spell with sharp frosts in many places. Night temperatures fell to 21° F. at Braemar on the 26th, and similar low readings were reported elsewhere. Wide spread ground frosts accompanied these low air temperatures. The lowest ground temperature was 12° F. at Braemar on the 26th.

Rainfall was just below average in a small area of North-East Aberdeenshire and another on the coast of East Lothian, but everywhere else it was above the average. Most of Scotland had one and a half times its usual rainfall. A great part of Argyll had double the usual amount, and so also had the Tain district of Ross-shire. At the majority of stations in the west there were 25 or more rain-days, as against 15 to 20 at eastern stations. Outstanding totals for the month were 17.88 inches at Conaglen (Ardgour) and 16.46 at Kingairloch. On six days falls of over 2 inches were reported. An exceptional fall was 4.26 inches at Conaglen on the

4th, and the total at this place for the three days 2nd-4th was 7.45 inches. It was a heavy downpour of 2.92 inches on the 20th, which mainly accounted for the large month's excess in the Tain district. There was widespread snow and sleet in the hills on the 24th-25th.

Despite the widespread wet weather, sunshine was above average on the east coast and average in the south and south-west. Leuchars had 179 hours (its highest record for September), and other places had 160 hours or more. On the other hand, at Onich the total was only 68, and Fort William and Augustus had 76 and 86 hours respectively.

OCTOBER.

This month also was wet and dull but not cold. Weather was again more favourable in the east than in the west.

Mean temperature was generally either normal or slightly above it. Fairly high readings were reported on the 14th and the 18th, the highest being 69 degrees in Banffshire on the 14th. In the last week temperature fell considerably, the 28th and 31st bringing sharp frosts in the south-west and on Deeside. Low night readings at this time were 23 degrees at Braemar, 26 degrees at Balmoral, and 25 degrees at Kilmarnock. Ground frosts were reported on 19 nights. They were widespread and severe, with readings down to 15° F. during the last week.

Rainfall was above average in the west and north, but below it in parts of East Scotland. Some areas of Argyll and Sutherland had more than double their average spread over 25 or more wet days, and a number of stations there had rain every day of the month. In the east, rainfall was about half as frequent. More than 3 inches in a day were recorded at a few places in the Glenquoich-Kinlochurn region on the 3rd, 4th, and 9th. Snow fell at a few places on the 8th and covered high ground generally in the last week.

Sunshine was mainly below average except on the coast between Fife and Aberdeen. At several stations in the west the deficit was 25 hours or more; Oban, with only 32 hours, was 49 below its average. The most favoured places had over 100 hours, the total at Leuchars reaching 120.

NOVEMBER.

November was outstandingly dry, and in many places the driest November on record. Sunshine was abundant in the east.

Mean temperature was about half a degree below the average for the country as a whole. It was average or slightly above average in the north, in the district round Fort William, and on the Ayrshire coast, but below average elsewhere. The deficit was some 2 or 3 degrees in Fife. Warm days for the time of year were the 6th, 14th, 15th, and 18th, Aberdeenshire stations being again favoured with temperatures of from 59 to 62 degrees on the 14th.

On the other hand, the 3rd, 4th, 5th, and the 22nd were cold, Braemar having a night temperature of 14° F. on the 4th, and West Linton, Peebles, and Wolfelee 18° F. on the 22nd. Ground frosts were reported on every night except the 9th-10th, and the ground-level temperature at Braemar fell to 8° F. on the 4th.

The month was the second driest November for which data are available, only November 1937 having surpassed it. Everywhere the month's rainfall was below average, and in the east and south some parts had only about one-tenth of their average. There were many low records. The Aberdeen total of 0.81 inch was the least in November since observations started in 1871, and Swinton in Berwickshire had only 0.21 inch. At some places there was a sixteen days' drought from the 12th to the 27th, but in general a few light showers broke the drought. Such rain as did fall was reported chiefly between the 6th and the 11th, and in the last three days of the month. There were some fairly heavy falls on the 4th and 6th in the west.

Sunshine was generally abundant east and south of the Great Glen. In the most favoured area (the Firth of Tay) the totals ranged from 80 to rather over 90 hours. Weather was dull, however, in many parts of the west and in the islands. Glasgow had only 23 hours, Lerwick 24, and Duntuiln (Skye) 26.

DECEMBER.

This was a mild and stormy month, with frequent and heavy rainfall in west and central districts.

Mean temperature was about 3 degrees above the average for the whole country. The excess was 4 or 5 degrees in the Clyde area, at Perth, and in the southern parts of the Great Glen. The spell from the 6th to the 10th was exceptionally mild, temperatures rising well above 50° F. The highest readings reported were 59 degrees at Dundee and 58 at Stonehaven. The 21st was also very mild, Fort William having 57 degrees and Onich and Fortrose 56. The first four days of the month and the 29th-30th were cold. Night temperature fell to 12 degrees at West Linton on the 3rd. Ground frosts were infrequent compared with the average. Nevertheless there was widespread frost in the first few days and it was severe in the south. West Linton, for example, had a ground-level temperature of 8 degrees on the 3rd.

Precipitation was plentiful over most of the country except during the first three days. A few places in west and central districts had rain on every day from the 4th to the 31st. The monthly totals were one and a half times the average (or more) at some places in the south-west Lowlands and in the Western Highlands. In the east, however, the Lothians and Berwickshire had only half their usual rainfall. Snow fell widely during the first six and the last five days of the month. The greatest depth (4 inches) was reported from the Loch Broom district on the 2nd. Braemar had between 2 and 3 inches on the 31st.

Sunshine was generally about average—somewhat above at a few places in the southern half of the country and below in the west and north. Among the best totals were 52 hours at Dunfermline and 50 at Edinburgh. Among the poorest were 4 at Fort William and 8 at Glasgow.

GENERAL NOTES.

Outstanding characteristics of the year, summarised briefly, were: (1) the cold and snowstorms, especially in the east during the first quarter, the cold being most marked in February; (2) cold east winds and unusual dryness in spring, but with an abnormally sunny April; (3) dull days in June; (4) the wetness of July to October, more especially in the west; (5) abnormal dryness in November; and (6) mild storminess with much rain in the west during December. Temperature in the shade reached 82° F. at Peebles on 5th June, and fell to 3 degrees below zero at Braemar on the notably late date 8th March. Rainfall over the whole year was above average in the west, but below it in the east, and sunshine on the whole was average or rather less than average.

RAINFALL (MEASURED IN INCHES) FOR 1942

AT SELECTED STATIONS IN SCOTLAND.

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Shetland—Lerwick	4.94	2.06	2.24	1.26	3.52	2.28	2.68	2.54	4.83	5.72	3.28	5.51	40.86
Orkney—Kirkwall	4.98	2.79	1.24	.64	2.19	1.53	2.33	2.38	5.28	6.30	2.12	4.69	37.37
Caithness—Wick	4.37	2.29	1.22	.96	1.96	.98	3.66	1.71	3.22	4.80	1.35	3.59	29.31
Sutherland—Melvich	3.79	3.59	1.87	1.22	1.77	1.40	5.42	2.60	5.68	7.82	2.07	5.56	42.29
Lairg	3.95	2.86	1.20	1.12	2.28	1.90	2.72	3.13	4.42	7.82	1.52	4.12	37.04
Ross and Cromarty—													
Portree	2.01	1.39	.69	2.01	2.70	.93	2.55	3.14	3.74	3.81	.93	2.87	26.77
Tain	3.24	2.33	1.27	2.21	3.75	1.00	2.34	3.11	5.25	4.68	1.46	3.76	34.40
Lochcarron	7.95	4.24	3.89	1.27	2.61	5.59	8.22	8.59	7.47	10.15	5.21	12.53	73.02
Stornoway	4.40	3.29	2.65	1.19	1.53	2.25	4.75	3.97	4.54	6.02	2.60	7.73	44.92
Inverness—													
Inverness	1.80	1.94	.55	1.69	2.22	.58	2.01	3.15	3.98	4.11	1.18	2.58	25.79
Fort-William	7.17	2.74	2.84	2.86	2.61	3.78	5.54	9.08	11.63	12.22	3.04	14.14	77.65
Glenquich	10.93	5.25	2.97	3.64	4.86	6.14	9.01	11.86	13.63	19.40	5.62	20.65	113.96
Portree	7.08	3.05	2.27	2.35	4.34	4.81	5.99	7.23	7.81	11.52	5.58	13.51	74.39
Nairn—Nairn	2.04	1.69	.64	1.61	2.65	.65	2.33	3.07	3.57	3.47	.67	2.07	25.06
Moray—Gordon Castle	4.06	2.78	1.02	.75	1.47	1.21	2.89	2.19	3.16	5.28	1.75	2.24	28.80
Aberlour (Wester													
Elchies)	2.50	1.98	.72	1.45	2.11	1.39	4.24	1.93	2.77	5.26	1.28	1.80	27.43
Banff—Banff	3.96	1.69	1.19	.40	1.32	.97	2.07	1.95	2.04	5.03	1.33	3.24	25.19
Aberdeen—Peterhead	3.59	1.62	.90	.99	1.51	1.16	1.82	1.36	2.23	4.47	1.58	2.71	23.94
Aberdeen (King's Coll.)	4.55	2.00	1.00	1.37	3.06	1.01	1.72	2.67	2.92	3.87	.81	2.05	26.93
Balmoral	3.54	1.47	1.47	1.40	3.21	1.80	1.74	2.35	2.81	3.82	.67	3.21	26.99
Kincardine—Fordoun	6.46	3.99	1.62	2.01	3.59	.99	3.85	2.38	3.22	3.65	.63	2.52	34.41
Angus—													
Montrose (Asylum)	4.07	2.04	1.53	1.46	3.00	.88	2.17	3.02	3.21	2.90	.38	2.31	26.97
Dundee	4.04	1.83	1.32	1.63	3.64	1.22	2.48	2.14	2.71	2.03	.46	1.78	25.28
Glamis Castle	3.99	1.57	2.69	2.10	4.29	.85	4.09	3.83	2.91	2.38	.59	3.52	32.81
Brechin	6.81	2.27	2.59	1.42	3.58	1.04	3.22	3.72	2.81	2.74	.44	3.32	33.46
Perth—Blair Castle	3.61	1.79	2.99	2.72	3.91	1.21	2.23	3.80	4.17	3.60	1.11	5.23	36.37
Crieff	3.94	1.87	3.40	2.07	3.88	1.67	1.54	6.34	5.25	3.04	.83	6.26	40.09
Perth	3.37	1.20	1.81	1.92	3.03	1.11	2.02	2.94	3.12	1.98	.44	2.00	24.94
Fife—Cupar	3.61	1.67	1.98	1.72	3.33	1.05	3.05	2.24	2.71	2.00	.38	2.43	26.12
Kirkcaldy	2.52	1.38	1.49	2.08	2.58	.86	3.53	2.37	2.53	2.22	.38	1.80	28.74
Kinross—Loch Leven	3.50	1.51	2.72	2.43	3.61	.87	2.52	2.43	3.27	2.75	.58	3.02	29.21
Clackmannan—													
Tillicoultry	5.19	1.38	3.24	2.77	3.07	1.22	2.31	3.74	4.77	3.78	.53	3.28	35.58
Argyll—Gruinle (Mull)	8.99	4.33	5.20	3.21	4.32	4.36	7.58	10.33	13.27	9.35	4.44	14.27	89.65
Oban	5.51	2.58	2.80	2.49	2.80	3.54	4.69	6.58	7.88	7.14	2.39	9.49	57.79
Glencoe Gardens	6.57	2.97	2.66	3.52	3.67	3.33	6.91	11.03	11.86	13.43	3.75	17.25	86.45
Inveraray	9.27	3.82	4.80	3.26	4.44	3.54	7.47	12.83	12.87	14.10	2.93	12.91	92.24
Bute—Rotheray	8.91	2.29	3.63	2.34	3.80	2.22	5.03	6.04	7.08	7.74	1.37	8.06	58.51
Stirling—Stirling	6.15	1.44	2.55	2.79	2.87	1.11	1.89	4.08	5.43	2.84	.62	4.67	36.44
Dumbarton—Arrochar	3.88	2.81	5.69	3.74	5.31	3.13	6.94	10.60	11.08	11.61	2.08	12.18	83.60
Helensburgh	7.44	1.60	5.33	3.29	3.28	2.93	3.56	5.83	5.98	7.94	1.33	7.65	55.18
Renfrew—Greenock	9.68	2.48	4.80	3.07	3.38	2.56	4.01	5.78	6.87	8.82	1.53	10.10	63.08
Paisley	6.64	1.87	2.63	2.38	2.92	1.73	1.96	4.58	4.96	4.82	.70	6.11	41.80
Ayr—Kilmarnock	5.85	1.48	1.81	1.97	3.14	1.30	3.61	5.69	4.86	5.74	.98	4.80	41.31
Ayr	4.78	1.22	1.73	1.10	2.04	1.67	3.00	4.00	3.81	3.94	.81	4.84	32.94
Muirkirk	6.78	1.19	2.71	1.95	2.83	1.03	4.47	4.10	5.33	7.89	1.42	6.05	45.84
Ballantrae	6.85	1.55	3.17	2.50	2.72	.93	3.61	4.52	4.60	5.31	.82	6.46	43.04
Leamington—													
Glasgow (Botanic Gdns.)	5.38	1.83	3.04	2.59	2.67	1.36	2.20	3.80	4.02	4.77	.72	4.41	37.69
Douglas (Newmains)	4.78	1.27	2.19	1.53	2.66	1.10	2.97	3.82	4.08	6.06	1.01	5.41	36.83
Bisgar	3.77	1.08	1.60	1.23	1.64	.71	2.67	3.53	3.68	3.65	.84	3.75	23.15
Linlithgow—													
Houston House	4.14	1.44	1.57	2.79	1.90	1.06	2.33	2.47	3.87	3.57	.65	2.44	28.23
Midlothian—													
Edinburgh (University)	3.11	1.46	1.07	1.48	1.39	1.00	3.26	2.45	2.69	2.51	.61	1.52	22.53
Gorebridge	3.39	1.26	1.43	1.33	1.13	.39	3.41	2.62	2.22	3.19	.67	1.35	23.39
Oxenford Castle	3.52	1.13	1.05	1.39	1.09	1.07	3.01	2.05	1.94	3.02	.65	1.29	21.21
Haddington—													
North Berwick	2.99	1.16	.88	1.31	1.30	.92	2.35	2.07	1.84	1.92	.43	.75	17.92
Stobshiels Reservoir	3.88	2.80	1.08	1.16	1.82	1.13	4.11	2.03	1.42	2.77	.72	1.71	23.68
Berwick—Duns Castle	4.51	2.82	1.68	1.08	2.87	1.01	2.39	1.74	2.64	2.76	.54	1.66	25.70
Marchmont	4.54	2.90	1.91	1.20	2.48	.96	2.40	2.61	2.70	2.99	.45	1.88	27.00
Peebles—West Linton	5.67	1.54	2.28	1.58	2.42	1.08	2.31	3.53	3.59	5.07	.90	2.77	33.24
Selkirk — Caddonfoot													
(Fairlie Gardens)	5.21	2.03	2.01	1.46	2.78	.91	2.10	2.07	3.05	2.84	.59	3.20	28.25
Roxburgh—													
Kelso (Broomlands)	2.54	1.53	1.32	.60	2.25	1.12	2.95	1.53	2.33	2.02	.36	1.15	19.70
Wolfelee	3.57	2.16	2.29	1.77	3.47	.97	3.00	2.40	3.70	3.06	.71	4.34	31.44
Dumfries—Dumfries	4.92	1.16	4.62	2.63	4.26	.80	2.69	4.44	4.16	3.94	1.09	6.07	47.18
Moniaive	3.89	2.52	5.22	3.95	5.61	1.09	3.32	5.72	5.27	5.91	1.88	9.28	53.76
Langholm	5.00	1.78	3.14	2.92	5.82	.86	3.60	5.50	6.81	5.40	2.41	7.10	49.84
Bakdamulr	8.31	2.89	4.70	3.18	5.42	1.13	4.02	5.41	7.05	6.70	1.48	9.24	59.53
Kirkcudbright — Castle													
Douglas (Corbleton)	6.35	2.03	3.93	2.62	4.22	.74	2.63	4.59	4.57	5.22	1.10	7.72	45.72
Carsphairn (Cornharrow)	8.70	2.81	4.80	4.29	5.58	.91	4.41	5.99	7.03	6.63	1.74	8.76	61.65
Auchincarrn	6.83	1.79	4.66	2.40	4.87	1.01	3.13	3.95	4.10	5.81	1.26	7.74	47.10
Wigtown—Monreith	7.97	2.33	4.30	2.15	2.81	.96	3.33	4.63	5.17	5.57	.49	6.01	45.72

AGRICULTURAL STATISTICS.

NOTE.—OWING TO WAR-TIME RESTRICTIONS, DETAILS UNDER
TABLES 1-20 ARE NOT AVAILABLE.

EDINBURGH CORN MARKET.

STATEMENT SHOWING THE PRICES OF WHEAT, BARLEY, AND OATS FOR THE
YEAR 1942.

The Corn Sales Act of 1921 provides that all sales are to be effected by weight only, and expressed in terms of or by reference to the hundredweight of 112 lb. Experience has proved it to be convenient to quote at a price per 4½ cwt. for Wheat, 4 cwt. for Barley, and 3 cwt. for Oats.

The following statement gives a record of the year's proceedings in Edinburgh Corn Market.

1942.	WHEAT, per 4½ cwt.		BARLEY, per 4 cwt.		OATS, per 3 cwt.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
January 7	89 9	..	155 0	100 0	43 6	35 0
" 14	89 9	..	163 0	125 0	42 0	35 0
" 21	89 9	..	200 0	125 0	48 6	38 0
" 28	89 9	..	230 6	140 0	48 6	35 0
February 4	70 10½	..	260 0	180 0	45 3	39 0
" 11	70 10½	..	280 0	220 0	44 3	39 0
" 18	70 10½	..	320 0	280 0	44 3	39 0
" 25	70 10½	..	340 0	180 0	44 3	38 0
March 4	70 10½	..	320 0	180 0	45 6	38 0
" 11	70 10½	..	280 0	200 0	45 9	38 0
" 18	70 10½	..	270 0	160 0	45 0	38 0
" 25	70 10½	..	300 0	180 0	45 0	38 0
April 1	70 10½	..	300 0	200 0	45 0	38 0
" 8	70 10½	..	320 0	200 0	45 0	38 0
" 15	70 10½	..	340 0	200 0	45 0	40 0
" 22	70 10½	..	340 0	200 0	45 0	40 0
" 29	70 10½	..	340 0	180 0	45 0	40 0
May 6	70 10½	..	340 0	200 0	45 0	40 0
" 13	70 10½	..	340 0	200 0	45 0	40 0
" 20	70 10½	..	340 0	180 0	45 0	40 0
" 27	70 10½	..	340 0	200 0	45 0	40 0
June 3	67 6	..	340 0	240 0	45 0	40 0
" 10	67 6	..	340 0	240 0	46 0	39 0
" 17	67 6	..	320 0	200 0	45 3	38 0
" 24	67 6	..	320 0	150 0	43 6	37 6
July 1	67 6	..	220 0	150 0	43 6	37 0
" 8	67 6	..	200 0	150 0	43 6	37 0
" 15	67 6	..	140 0	..	43 6	37 0
" 22	67 6	..	140 0	..	43 6	37 0
" 29	67 6	..	..	..	43 6	37 0
August 5	73 1½	58 6	140 0	..	43 6	42 0
" 12	73 1½	58 6	..	..	44 3	42 0
" 19	72 0	58 6	..	..	43 6	42 0
" 26	72 0	58 6	140 0	..	44 3	42 0
September 2	72 0	58 6	140 0	..	44 3	42 0
" 9	72 0	53 6	140 0	..	44 3	42 0
" 16	72 0	..	140 0	..	44 3	43 6
" 23	72 0	..	140 0	..	44 3	42 0
" 30	72 0	..	140 0	110 0	44 3	42 0
October 7	72 0	..	140 0	100 0	44 3	42 0
" 14	72 0	..	140 0	100 0	44 3	42 0
" 21	72 0	..	140 0	100 0	44 3	42 0
" 28	72 0	..	140 0	100 0	44 3	42 0
November 4	72 9	..	140 0	100 0	44 9	42 0
" 11	72 9	..	140 0	110 0	44 9	42 0
" 18	72 9	..	140 0	120 0	44 9	42 0
" 25	72 9	..	140 0	100 0	44 9	42 0
December 2	73 6	..	140 0	100 0	45 3	42 6
" 9	73 6	..	140 0	110 0	45 3	42 6
" 16	73 6	..	140 0	90 0	45 3	42 6
" 23	73 6	..	140 0	100 0	45 3	42 6
" 30	73 6	..	140 0	120 0	45 3	42 6

PRICES OF SHEEP SINCE 1818.

TABLE No. 1.—CHEVIOT SHEEP.

Year.	Wethers.		Ewes.		Lambs.	
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1818	28 0	to 30 0	not quoted.		8 0	to 10 0
1819	25 0	" 27 0	15 0	to 17 0	10 6	" 12 0
1820	20 0	" 25 0	16 0	" 17 0	10 0	" 11 0
1821	18 0	" 20 0	14 0	" 16 0	7 6	" 8 0
1822	12 6	" 13 0	8 0	" 8 6	4 6	" 0 0
1823	13 6	" 18 0	7 0	" 10 6	5 6	" 6 0
1824	14 0	" 19 0	7 0	" 9 0	4 6	" 6 0
1825	29 0	" 32 0	15 0	" 19 0	9 0	" 10 6
1826	17 6	" 21 6	18 0	" 15 0	7 0	" 7 6
1827	15 0	" 24 0	not quoted.		7 0	" 8 0
1828	18 0	" 27 6	12 0	to 15 0	7 0	" 8 3
1829	18 0	" 24 0	12 6	" 14 0	7 0	" 8 6
1830	15 0	" 21 0	8 0	" 11 0	6 0	" 6 9
1831	18 0	" 25 0	9 0	" 13 0	7 0	" 8 0
1832	19 0	" 24 0	11 0	" 16 0	7 0	" 9 0
1833	22 0	" 31 0	13 6	" 20 0	8 0	" 11 3
1834	22 0	" 31 0	13 6	" 21 0	9 0	" 11 6
1835	22 0	" 27 6	18 0	" 20 6	8 0	" 11 0
1836	24 0	" 31 6	16 0	" 19 0	10 0	" 14 0
1837	19 0	" 28 0	14 0	" 19 0	10 0	" 13 0
1838	28 0	" 30 6	17 0	" 22 0	12 0	" 14 0
1839	23 0	" 31 0	14 0	" 19 0	0 0	" 13 6
1840	24 0	" 33 0	15 0	" 23 0	7 0	" 11 6
1841	23 0	" 30 0	14 0	" 22 0	8 0	" 12 0
1842	22 6	" 28 0	18 0	" 17 0	7 6	" 10 0
1843	19 0	" 25 0	8 0	" 12 0	6 0	" 8 0
1844	21 0	" 29 0	10 0	" 16 0	8 0	" 10 6
1845	23 0	" 33 0	18 0	" 20 0	8 0	" 13 0
1846	24 0	" 33 6	14 6	" 21 6	10 0	" 14 6
1847	24 0	" 35 0	13 0	" 24 0	11 6	" 15 0
1848	23 0	" 34 6	13 0	" 28 0	11 6	" 15 0
1849	21 0	" 30 2	12 0	" 21 0	0 0	" 14 0
1850	30 6	" 29 6	12 0	" 20 0	8 0	" 18 0
1851	21 6	" 31 0	13 0	" 21 0	8 9	" 14 0
1852	21 0	" 32 0	15 0	" 23 0	8 0	" 14 0
1853	26 6	" 38 0	17 0	" 28 6	9 0	" 17 0
1854	25 0	" 36 0	17 0	" 26 0	9 0	" 16 6
1855	23 6	" 36 0	16 0	" 25 0	10 0	" 17 0
1856	22 0	" 35 6	15 6	" 24 0	10 0	" 15 0
1857	24 0	" 36 0	14 6	" 26 0	10 6	" 14 6
1858	24 0	" 34 6	14 0	" 24 6	10 6	" 14 0
1859	25 0	" 34 6	16 0	" 25 0	10 3	" 14 9
1860	26 0	" 38 0	17 6	" 27 6	12 6	" 17 6
1861	25 0	" 38 6	16 0	" 28 0	9 0	" 16 0
1862	27 0	" 37 6	17 6	" 28 0	10 0	" 16 0
1863	25 0	" 38 6	19 0	" 28 6	10 6	" 16 0
1864	31 0	" 41 0	21 0	" 31 6	14 0	" 18 0
1865	32 6	" 44 0	22 6	" 33 6	14 6	" 20 0
1866	37 0	" 50 0	29 0	" 42 6	15 0	" 26 0
1867	28 0	" 58 0	18 0	" 25 6	12 0	" 16 0
1868	30 0	" 52 0	15 6	" 21 0	7 6	" 13 0
1869	28 0	" 38 0	15 0	" 22 6	7 6	" 14 0
1870	35 6	" 48 0	18 0	" 28 0	10 0	" 17 0
1871	36 6	" 49 0	22 0	" 33 6	14 0	" 30 0
1872	45 0	" 56 0	32 0	" 42 0	16 0	" 22 0
1873	42 0	" 51 0	25 0	" 42 0	15 6	" 22 0
1874	33 6	" 44 6	21 0	" 36 0	12 0	" 17 0

TABLE No. 1.—CHEVIOT SHEEP—Continued.

Year.	Wethers.				Ewes.				Lambs.						
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.			
1875	33	0	to	48	6	21	0	to	34	0	13	6	to	23	6
1876	40	0	"	52	6	23	0	"	30	0	18	6	"	25	0
1877	41	0	"	51	0	25	0	"	37	0	15	0	"	24	0
1878	35	6	"	48	0	23	6	"	35	0	14	0	"	22	0
1879	34	0	"	44	0	21	0	"	34	0	14	0	"	20	0
1880	30	0	"	43	6	20	0	"	30	0	12	6	"	20	0
1881	32	0	"	45	6	29	0	"	34	0	14	0	"	20	6
1882	40	0	"	51	0	30	0	"	40	0	14	0	"	23	0
1883	44	0	"	55	6	34	6	"	46	6	15	6	"	20	0
1884	36	0	"	47	6	29	6	"	41	6	12	6	"	18	0
1885	30	0	"	38	0	24	0	"	31	0	12	0	"	19	0
1886	32	0	"	40	0	21	0	"	29	0	11	0	"	16	6
1887	29	0	"	36	0	18	0	"	26	0	12	0	"	17	6
1888	30	0	"	38	0	19	0	"	27	0	12	0	"	22	0
1889	36	0	"	44	0	24	0	"	32	0	14	0	"	20	0
1890	31	0	"	40	0	22	0	"	30	0	12	6	"	16	0
1891	27	0	"	38	0	16	0	"	25	0	9	0	"	11	0
1892	22	0	"	30	6	13	0	"	22	0	6	0	"	11	0
1893	26	0	"	35	6	18	0	"	28	6	8	6	"	15	0
1894	26	0	"	37	0	20	0	"	31	0	10	6	"	18	6
1895	28	0	"	39	0	22	0	"	34	0	11	6	"	19	6
1896	24	6	"	34	0	19	0	"	30	6	9	0	"	16	6
1897	27	0	"	36	0	21	0	"	31	6	11	0	"	17	6
1898	27	0	"	37	0	22	0	"	32	6	12	0	"	18	6
1899	24	0	"	33	0	20	0	"	30	6	10	6	"	16	0
1900	26	0	"	36	0	22	0	"	32	6	12	0	"	17	0
1901	25	0	"	32	6	20	0	"	29	6	11	0	"	16	0
1902	24	0	"	31	6	18	0	"	27	0	9	6	"	14	6
1903	26	0	"	34	0	21	0	"	31	0	11	4	"	18	0
1904	28	6	"	36	6	23	0	"	32	6	13	0	"	20	0
1905	27	6	"	35	0	23	0	"	33	0	14	0	"	21	0
1906	30	0	"	38	0	26	0	"	34	6	15	0	"	23	0
1907	28	0	"	34	0	22	0	"	30	6	13	6	"	19	6
1908	26	0	"	32	6	21	0	"	27	6	11	6	"	17	0
1909	24	0	"	31	0	18	0	"	25	6	9	6	"	16	0
1910	27	0	"	35	0	22	0	"	31	0	12	0	"	20	0
1911	24	0	"	31	6	18	6	"	27	6	10	6	"	18	0
1912	26	0	"	34	6	22	0	"	31	0	13	0	"	21	0
1913	30	0	"	39	0	24	0	"	35	6	16	0	"	24	0
1914	32	6	"	41	0	28	0	"	39	0	18	0	"	27	6
1915	36	0	"	46	0	31	0	"	44	0	20	0	"	30	6
1916	40	6	"	51	0	34	0	"	49	0	22	0	"	34	6
1917	43	6	"	56	0	38	0	"	56	6	24	0	"	34	0
1918	50	0	"	66	0	42	0	"	61	0	25	0	"	37	0
1919	53	0	"	69	0	44	6	"	67	0	28	0	"	40	6
1920	56	0	"	91	0	48	0	"	79	0	34	0	"	49	0
1921	45	0	"	60	0	52	8	"	85	9	33	9	"	52	3
1922	40	0	"	56	0	56	0	"	90	6	27	0	"	50	0
1923	44	0	"	65	0	61	0	"	106	0	30	0	"	62	0

Year.	Wethers.				Ewes.				Lambs.						
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.			
1924	41	0	to	61	0	60	0	to	110	0	31	6	to	58	0
1925	39	3	"	50	0	56	0	"	88	9	22	3	"	50	6
1926	35	0	"	49	3	34	6	"	64	6	26	3	"	42	0
1927	28	9	"	46	3	32	6	"	55	6	23	3	"	39	0
1928	28	3	"	48	6	30	6	"	55	6	22	9	"	47	9
1929	33	6	"	51	6	34	0	"	52	0	25	6	"	47	0
1930	36	0	"	54	0	35	0	"	74	6	24	0	"	47	3
1931	24	0	"	45	6	23	0	"	50	9	17	0	"	37	0
1932	16	0	"	26	6	18	0	"	36	6	10	0	"	24	6
1933	16	0	"	28	0	25	3	"	40	0	16	6	"	31	6
1934	16	0	"	31	3	22	6	"	44	3	19	6	"	33	3
1935	22	0	"	37	3	24	0	"	44	3	16	0	"	38	3
1936	24	6	"	50	0	23	0	"	55	0	18	6	"	37	6
1937	24	6	"	49	6	29	9	"	76	6	19	0	"	45	3
1938	17	0	"	39	6	20	9	"	61	0	10	9	"	31	6
1939	19	6	"	42	9	18	6	"	43	3	11	6	"	39	9
1940	31	0	"	64	0	22	6	"	60	0	15	6	"	41	0
1941	36	6	"	63	9	26	6	"	71	0	18	3	"	59	0
1942	37	0	"	67	3	33	6	"	90	0	20	6	"	59	6

TABLE NO. 2.—BLACKFACE SHEEP.

Year.	Wethers.				Ewes.				Lambs.							
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.		
1819	22	0	to	24	0	12	0	to	15	0	8	0	to	9	0	
1820	20	0	"	23	3	15	6	"	17	0	7	0	"	8	6	
1821	18	0	"	20	0	12	0	"	18	0	6	0	"	7	0	
1822	11	6	"	13	6	5	6	"	6	6	4	6	"	0	0	
1823	12	0	"	16	0	5	0	"	6	6	4	0	"	5	3	
1824	9	6	"	13	6	6	0	"	7	0	4	0	"	5	0	
1825	22	0	"	26	0	11	0	"	13	6	6	0	"	9	0	
1826	15	0	"	17	0	8	0	"	9	0	4	6	"	6	0	
1827	14	0	"	18	6	7	0	"	10	0	6	0	"	7	6	
1828	15	0	"	20	0	8	0	"	11	0	5	0	"	7	6	
1829	14	0	"	18	0	9	0	"	10	0	6	0	"	7	0	
1830	9	6	"	13	0	4	0	"	6	0	4	6	"	6	0	
1831	13	0	"	17	0	5	0	"	7	6	5	0	"	6	6	
1832	14	0	"	18	0	7	0	"	11	6	6	0	"	7	8	
1833	16	0	"	24	0	7	6	"	12	0	6	6	"	9	0	
1834	16	0	"	22	0	10	0	"	13	0	6	0	"	8	6	
1835	15	0	"	18	9	10	0	"	18	0	7	0	"	8	0	
1836	15	0	"	21	0	9	0	"	12	0	8	6	"	11	0	
1837	13	0	"	16	0	8	0	"	12	0	8	0	"	9	6	
1838	15	0	"	20	6	10	0	"	13	0	not quoted.					
1839	15	0	"	22	0	10	0	"	12	0	7	0	to	8	3	
1840	15	0	"	22	6	11	0	"	12	0	7	0	"	9	3	
1841	16	0	"	20	0	9	0	"	11	0	6	0	"	8	0	
1842	14	0	"	19	0	7	6	"	8	0	5	6	"	7	0	
1843	not quoted.				4	9	"	6	6	not quoted.						
1844	15	0	to	21	0	6	6	"	10	0	5	0	to	8	0	
1845	14	0	"	23	0	8	0	"	12	0	6	0	"	8	0	
1846	13	0	"	24	0	10	0	"	13	0	8	0	"	9	0	
1847	20	6	"	25	0	10	0	"	14	0	8	6	"	9	6	
1848	20	0	"	24	0	11	3	"	12	0	8	6	"	10	0	
1849	not quoted.				not quoted.				7				0	"	7	6
1850											7	0	"	0	0	
1851	17	6	to	23	0	9	0	to	12	0	6	6	"	8	0	
1852	18	6	"	22	0	9	6	"	12	0	4	6	"	7	9	
1853	23	0	"	27	0	14	6	"	16	6	8	0	"	11	6	
1854	20	0	"	26	0	11	0	"	16	6	8	0	"	10	6	
1855	23	6	"	26	6	14	0	"	16	0	10	0	"	11	0	
1856	17	0	"	24	0	10	0	"	20	0	7	6	"	10	0	
1857	20	0	"	29	0	10	6	"	15	0	9	3	"	11	0	
1858	20	0	"	27	6	9	9	"	18	9	8	3	"	10	6	
1859	20	0	"	25	0	10	0	"	14	0	8	9	"	11	0	
1860	21	0	"	27	3	11	0	"	16	0	10	0	"	13	6	
1861	21	0	"	29	0	12	0	"	22	0	6	3	"	14	0	
1862	16	9	"	27	0	12	0	"	18	3	6	0	"	12	0	
1863	20	0	"	30	6	13	0	"	16	0	8	0	"	11	6	
1864	25	0	"	30	0	15	0	"	19	0	10	0	"	13	6	
1865	15	6	"	32	6	15	0	"	25	0	10	0	"	17	0	
1866	31	6	"	40	0	20	0	"	30	0	13	6	"	22	6	
1867	20	0	"	30	6	14	0	"	22	0	7	6	"	13	6	
1868	20	0	"	26	0	10	6	"	13	6	7	0	"	13	0	
1869	22	0	"	28	0	11	0	"	11	0	6	9	"	9	0	
1870	27	0	"	32	6	13	0	"	22	0	8	0	"	14	6	
1871	23	0	"	37	0	13	0	"	23	0	11	0	"	16	3	
1872	31	6	"	45	0	13	0	"	32	0	12	6	"	18	0	
1873	23	0	"	39	0	16	6	"	27	0	7	0	"	16	0	
1874	25	0	"	35	0	13	0	"	20	0	7	0	"	14	0	
1875	26	6	"	37	6	15	0	"	21	3	9	6	"	17	6	
1876	30	0	"	40	0	19	0	"	24	0	13	0	"	20	6	
1877	35	0	"	33	9	13	0	"	25	0	13	6	"	23	0	
1878	30	0	"	36	0	17	0	"	23	0	12	0	"	22	0	
1879	25	0	"	35	9	16	0	"	24	0	10	6	"	20	0	
1880	25	0	"	38	0	16	6	"	22	6	10	0	"	17	0	
1881	30	0	"	39	0	15	0	"	23	0	10	0	"	15	0	
1882	33	0	"	46	0	20	0	"	28	0	12	6	"	18	6	
1883	36	0	"	56	6	24	6	"	33	0	14	0	"	21	6	
1884	29	0	"	43	6	19	6	"	28	0	12	0	"	19	6	
1885	24	0	"	34	0	13	0	"	22	6	10	0	"	15	0	
1886	25	0	"	34	0	12	0	"	22	0	10	6	"	16	0	
1887	22	0	"	30	0	11	0	"	19	0	8	0	"	13	0	
1888	22	0	"	32	0	13	0	"	24	0	10	0	"	15	0	
1889	26	0	"	40	0	13	0	"	29	0	13	0	"	22	6	

TABLE NO. 2.—BLACKFACE SHEEP—Continued.

Year.	Wethers.				Ewes.				Lambs.			
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
1890	24	0	to	37	0	14	0	to	27	0	10	6
1891	21	0	"	37	0	10	0	"	24	0	7	6
1892	16	0	"	28	6	6	0	"	17	0	3	0
1893	21	0	"	37	0	12	0	"	24	0	7	0
1894	20	0	"	37	0	14	6	"	26	6	8	6
1895	23	0	"	41	0	16	0	"	28	6	9	0
1896	19	0	"	35	4	13	0	"	24	0	6	0
1897	21	0	"	36	6	15	0	"	25	6	7	0
1898	22	0	"	37	0	16	0	"	26	6	8	0
1899	20	0	"	33	6	13	0	"	24	0	5	6
1900	23	0	"	36	0	16	0	"	26	6	8	0
1901	20	0	"	35	0	14	0	"	25	6	6	6
1902	18	6	"	34	0	12	0	"	24	0	6	0
1903	21	0	"	36	0	15	0	"	28	0	7	0
1904	23	0	"	38	6	18	0	"	30	0	8	6
1905	21	6	"	37	0	19	0	"	31	0	9	0
1906	23	0	"	38	0	20	0	"	33	0	10	0
1907	21	0	"	38	6	17	0	"	28	0	8	6
1908	19	6	"	30	0	15	0	"	24	6	8	0
1909	17	0	"	28	0	11	6	"	22	0	6	3
1910	21	0	"	32	6	16	0	"	27	6	8	0
1911	19	0	"	29	6	14	0	"	24	0	7	0
1912	21	6	"	32	6	17	0	"	27	6	9	6
1913	24	6	"	36	0	21	0	"	31	0	12	6
1914	27	0	"	38	6	25	0	"	34	6	15	6
1915	31	0	"	42	6	29	0	"	39	6	17	0
1916	33	0	"	46	6	31	0	"	42	0	19	0
1917	36	0	"	51	0	33	0	"	47	0	21	0
1918	41	0	"	56	0	36	0	"	50	0	27	0
1919	44	0	"	62	0	39	0	"	54	0	29	0
1920	46	0	"	66	0	44	0	"	62	0	31	0
1921	32	9	"	60	9	35	3	"	62	6	20	3
1922	40	3	"	63	0	40	6	"	74	0	18	0
1923	46	0	"	65	6	43	0	"	78	0	21	0
1924	46	0	"	68	6	45	6	"	85	0	25	0
1925	36	0	"	60	0	40	0	"	78	0	17	6

Year.	Wethers.				Ewes.				Lambs.			
									Wethers.		Ewes.	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
1926	30	0	to	54	0	31	0	to	70	0	21	9
1927	26	6	"	48	0	26	0	"	64	0	17	9
1928	29	0	"	45	9	24	0	"	57	0	16	6
1929	29	9	"	46	0	29	0	"	64	0	20	9
1930	31	6	"	45	0	28	6	"	60	0	20	0
1931	19	6	"	29	9	15	0	"	33	0	14	3
1932	12	0	"	19	6	15	0	"	29	0	7	3
1933	..	..	..	..	..	20	0	"	34	0	12	9
1934	..	..	..	..	..	22	6	"	44	0	16	0
1935	..	..	..	..	..	26	0	"	40	0	16	0
1936	..	..	..	..	..	27	6	"	43	0	18	6
1937	..	..	..	..	..	32	0	"	54	0	22	6
1938	..	..	..	..	..	22	0	"	50	0	12	6
1939	..	..	..	..	..	17	6	"	40	0	12	6
1940	..	..	..	..	..	22	6	"	50	0	16	0
1941	..	..	..	..	..	27	6	"	52	6	19	0
1942	..	..	..	..	..	28	0	"	51	0	16	9

TABLE NO. 3.—PRICE OF WOOL, PER STONE OF 24 LB., SINCE 1818.

Year.	Laid Cheviot.		White Cheviot.		Laid Highland.		White Highland.	
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1818	40 0	to 42 2	..	..	20 0	to 22 6	..	..
1819	21 0	" 22 0	..	..	10 0	" 10 3	..	..
1820	20 0	" 22 0	..	..	9 0	" 10 0	..	..
1821	18 0	" 20 0	..	..	9 0	" 10 0	..	..
1822	12 6	" 14 6	..	..	5 0	" 6 6	..	..
1823	9 0	" 10 6	..	..	5 0	" 5 9	..	..
1824	13 6	" 15 0	..	..	6 0	" 6 3	..	..
1825	10 6	" 22 0	..	..	10 0	" 10 6	..	..
1826	11 0	" 14 0	..	..	5 0	" 5 6	..	..
1827	11 0	" 14 0	..	..	5 6	" 6 9	..	..
1828	8 0	" 11 0	..	..	5 6	" 6 0	..	..
1829	8 6	" 11 0	..	..	4 3	" 0 0	..	..
1830	9 6	" 11 0	..	..	4 6	" 5 0	..	..
1831	17 0	" 20 0	..	..	7 6	" 8 6	..	..
1832	14 0	" 16 0	..	..	7 0	" 7 6	..	..
1833	18 0	" 20 7	..	..	10 0	" 11 0	..	..
1834	21 0	" 24 6	..	..	5 6	" 7 0	..	..
1835	19 0	" 20 6	..	..	9 6	" 10 3	..	..
1836	21 0	" 25 0	..	..	10 0	" 14 0	..	..
1837	12 0	" 14 0	..	..	7 0	" 7 8	..	..
1838	19 0	" 22 6	..	..	6 0	" 10 0	..	..
1839	18 0	" 20 0	..	..	8 0	" 12 0	..	..
1840	15 0	" 0 0	..	..	7 0	" 0 0	..	..
1841	15 0	" 16 9	..	..	6 0	" 7 5	..	..
1842	12 6	" 14 0	..	..	not quoted.	..	..	..
1843	9 0	" 11 6	..	..	5 0	to 6 0	..	..
1844	15 0	" 18 0	..	..	not quoted.	..	..	..
1845	14 6	" 17 6	..	..	7 6	to 8 6	..	..
1846	12 0	" 14 6	..	..	8 0	" 8 6	..	..
1847	12 6	" 14 0	..	..	not quoted.	..	..	..
1848	9 6	" 11 0	..	..	4 9	to 0 0	..	..
1849	12 0	" 16 6	..	..	6 0	" 6 3	..	..
1850	15 0	" 17 6	..	..	8 0	" 8 6	..	..
1851	12 0	" 16 0	..	..	8 0	" 9 3	..	..
1852	13 0	" 15 0	..	..	8 0	" 9 0	..	..
1853	19 0	" 22 0	..	..	11 0	" 12 6	..	..
1854	12 0	" 15 0	..	..	7 6	" 8 6	..	..
1855	14 6	" 19 0	..	..	8 6	" 9 0	..	..
1856	19 0	" 21 6	..	..	11 0	" 0 0	..	..
1857	19 0	" 24 0	..	..	13 0	" 14 3	..	..
1858	15 0	" 17 0	..	..	8 9	" 10 0	..	..
1859	18 6	" 24 0	..	..	10 9	" 11 6	..	..
1860	22 0	" 32 0	..	..	10 0	" 11 3	..	..
1861	19 6	" 27 0	..	..	not quoted.	..	..	..
1862	18 6	" 26 0	..	..	11 6	to 16 0	..	..
1863	25 6	" 31 0	..	..	15 3	" 17 6	..	..
1864	31 0	" 39 0	..	..	17 6	" 20 0	..	..
1865	23 0	" 30 0	..	..	15 0	" 17 0	..	..
1866	24 0	" 30 0	..	..	14 0	" 16 0	..	..
1867	16 0	" 21 6	..	..	not quoted.	..	..	..
1868	19 0	" 26 0	..	..	8 6	to 9 0	..	..
1869	18 0	" 26 6	..	..	8 6	" 10 0	..	..
1870	15 0	" 23 6	..	..	9 6	" 0 0	..	..
1871	20 0	" 26 6	..	..	12 0	" 15 0	..	..
1872	26 0	" 37 6	..	..	18 0	" 21 0	..	..
1873	17 0	" 18 0	..	..	9 0	" 12 0	..	..
1874	18 6	" 26 6	..	..	9 6	" 13 0	..	..
1875	25 0	" 32 0	..	..	12 6	" 16 0	..	..
1876	20 0	" 24 0	..	..	9 6	" 12 0	..	..
1877	20 9	" 26 0	..	..	10 0	" 12 0	..	..
1878	18 9	" 25 0	..	..	8 6	" 11 6	..	..
1879	15 0	" 17 0	..	..	7 0	" 0 0	..	..
1880	20 0	" 24 0	..	..	10 6	" 11 6	14 0	to 15 0
1881	17 0	" 21 0	..	..	5 0	" 9 6	12 0	" 13 0
1882	14 0	" 18 0	..	..	7 6	" 9 0	18 0	" 14 0
1883	13 0	" 18 0	..	..	6 6	" 8 6	11 6	" 12 6
1884	13 0	" 18 0	..	..	6 6	" 8 6	11 6	" 12 6
1885	12 0	" 17 0	..	..	6 0	" 8 0	11 6	" 12 0
1886	13 0	" 18 0	..	..	6 6	" 8 6	11 6	" 12 0
1887	14 0	" 22 0	..	..	7 0	" 9 0	11 6	" 13 0
1888	13 0	" 20 0	..	..	7 0	" 9 0	11 0	" 12 6

TABLE NO. 3.—PRICE OF WOOL—Continued.

Year.	Laid Cheviot.				White Cheviot.				Laid Highland.				White Highland.							
	s.	d.	to	s.	d.	s.	d.	to	s.	d.	s.	d.	to	s.	d.	s.	d.	to	s.	d.
1889	13	0	to	18	0	24	0	to	28	0	7	0	to	9	0	11	0	to	12	6
1890	13	0	"	18	0	24	0	"	28	0	7	0	"	9	0	11	0	"	12	6
1891	12	6	"	18	0	22	0	"	28	0	7	0	"	9	0	11	0	"	12	6
1892	12	0	"	18	0	20	0	"	28	0	7	0	"	8	6	10	6	"	12	0
1893	12	0	"	17	0	20	0	"	27	0	7	0	"	8	0	10	0	"	12	0
1894	12	0	"	16	0	20	0	"	26	0	7	0	"	8	0	10	0	"	12	0
1895	12	0	"	16	0	20	0	"	25	0	7	0	"	8	0	10	0	"	11	6
1896	11	0	"	15	0	19	0	"	24	0	7	0	"	8	0	10	0	"	11	6
1897	11	0	"	14	0	18	0	"	23	0	7	0	"	8	0	10	6	"	12	0
1898	10	0	"	13	0	16	0	"	20	0	7	0	"	8	0	10	0	"	11	6
1899	10	0	"	13	0	13	0	"	18	6	7	0	"	8	0	8	6	"	9	6
1900	9	9	"	12	0	13	0	"	18	6	6	9	"	7	9	8	0	"	9	6
1901	9	0	"	10	0	11	0	"	16	6	5	9	"	6	6	8	0	"	9	0
1902	9	0	"	10	0	11	6	"	17	0	6	0	"	6	6	8	6	"	9	6
1903	10	0	"	12	0	15	0	"	18	0	7	0	"	8	0	11	6	"	12	6
1904	15	0	"	17	0	20	0	"	21	0	9	0	"	10	0	14	0	"	15	0
1905	17	0	"	20	0	24	0	"	26	0	10	0	"	11	0	15	0	"	16	0
1906	18	0	"	21	0	27	0	"	28	6	11	6	"	13	0	16	6	"	17	6
1907			"			22	0	"	24	0	11	0	"	12	6	16	0	"	17	0
1908			"			16	0	"	18	0			"			8	0	"	8	6
1909			"			24	0	"	26	0			"			12	6	"	14	0
1910			"			25	0	"	30	0			"			13	0	"	14	6
1911			"			25	0	"	30	0			"			13	0	"	14	6
1912			"			24	0	"	29	0			"			14	0	"	15	0
1913			"			25	0	"	30	0			"			17	0	"	18	0
1914			"			24	0	"	29	0			"			15	0	"	15	6
1915†			"			42	0	"	46	0			"			21	0	"	22	0

* No Cheviots smeared now. † No Highlands smeared now. ‡ These are July prices.

PRICE OF WOOL PER STONE OF 24 LB.—Continued.

		CHEVIOT.				HALF-BRED.				BLACK-FACE.		CROSS-BRED (BLACKFACE EWE AND LEICESTER RAM).			
		Hogg.		EWE AND WETHER.		Hogg.		EWE AND WETHER.		Hogg.	EWE AND WETHER.	Hogg.		EWE AND WETHER.	
		Washed.	Un- washed.	Washed.	Un- washed.	Washed.	Un- washed.	Washed.	Un- washed.			Washed.	Un- washed.	Washed.	Un- washed.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1 1916	{ CAITHNESS & SUTHERLAND	38 6	30 0	33 0	27 6	34 6	28 6	33 0	27 6	23 0	23 0	28 6	25 6	28 6	25 6
		10 0	32 6	34 0	29 0	35 0	29 0	34 0	28 6						
1 1917	{ CAITHNESS & SUTHERLAND	40 6	33 0	37 0	31 0	38 6	31 6	37 0	31 6	25 6	25 6	31 6	28 6	31 6	28 6
		44 6	36 0	37 6	32 6	39 0	32 6	37 6	31 6						
1 1918	{ CAITHNESS & SUTHERLAND	43 6	35 6	39 6	33 0	41 0	33 6	39 6	33 0	27 0	27 0	33 6	30 6	33 6	30 6
		47 6	38 6	40 0	34 6	41 6	34 6	40 0	33 6						
1919	{ CAITHNESS & SUTHERLAND	84 0	70 0	82 0	66 0	82 0	62 0	70 0	58 0	34 0	34 0	46 0	39 0	44 0	38 0
		88 0	74 0	84 0	68 0	84 0	63 0	72 0	60 0						
1920	{ CAITHNESS & SUTHERLAND	86 0	70 0	83 0	66 0	74 0	54 0	65 0	50 0	24 0	24 0	35 0	29 0	34 0	27 0
		90 0	74 0	87 0	68 0	76 0	56 0	68 0	52 0						
1921	{ CAITHNESS & SUTHERLAND	22 0	17 0	19 0	15 0	18 6	14 6	16 0	13 0	9 6	9 6	12 0	10 0	12 0	10 0
		23 0	18 0	20 0	16 0	19 6	15 6	17 0	14 0						
1922	{ CAITHNESS & SUTHERLAND	30 0	25 0	26 0	22 0	26 0	20 0	22 0	18 0	16 0	16 0	16 6	15 0	16 6	15 0
		31 6	26 0	27 0	23 0	27 0	21 0	23 0	19 0						
1923	{ CAITHNESS & SUTHERLAND	11 0	34 0	36 0	30 0	33 0	27 0	30 0	25 0	17 6	17 6	20 0	18 0	20 0	18 0
		43 0	35 0	37 0	31 0	34 0	28 0	31 0	26 0						
1924	{ CAITHNESS & SUTHERLAND	58 0	49 0	53 0	45 0	49 0	40 0	45 0	39 0	25 6	25 6	34 6	30 6	33 0	30 0
		60 0	50 0	54 0	46 0	50 0	41 0	46 0	40 0						
1925	{ CAITHNESS & SUTHERLAND	39 0	34 0	36 0	30 0	33 6	28 6	32 0	27 0	25 6	25 0	26 0	23 6	25 6	23 0
		40 0	35 0	37 0	31 0	34 0	29 0	33 0	28 0						
1926	{ CAITHNESS & SUTHERLAND	35 0	29 0	32 0	28 0	32 0	26 6	28 0	24 6	19 0	19 0	22 6	20 0	22 0	19 6
		36 0	30 0	33 0	29 0	33 0	27 6	29 0	25 6						
1927	{ CAITHNESS & SUTHERLAND	88 0	31 0	35 0	31 0	34 6	29 6	32 0	27 6	24 0	24 0	27 0	25 6	27 0	25 0
		39 0	32 0	36 0	32 0	35 0	30 0	33 0	28 6						
1928	{ CAITHNESS & SUTHERLAND	51 0	43 0	48 0	41 0	47 0	40 0	48 0	37 0	24 6	24 6	33 0	31 0	32 0	30 0
		52 0	44 0	49 0	42 0	48 0	41 0	44 0	38 0						
1929		37 0	32 0	34 0	29 6	34 0	29 0	32 0	27 0	24 0	24 0	27 0	25 0	26 0	24 0
1930		23 0	19 0	22 0	18 0	21 0	17 6	20 0	16 6	12 0	12 0	17 6	15 6	16 6	15 6
1931		16 6	13 6	15 6	13 0	15 0	13 0	13 6	11 6	11 0	11 0	12 0	10 6	11 6	10 0
1932		14 6	11 6	14 0	11 6	12 6	11 6	11 6	9 6	8 0	8 0	9 0	8 6	8 0	7 6
1933		20 0	17 0	19 0	16 0	18 0	16 0	17 0	14 0	11 6	11 6	12 0	11 0	11 6	11 0
1934		21 6	17 6	21 0	17 0	19 0	17 0	17 0	14 0	10 0	10 0	12 0	11 0	12 0	11 0
1935		26 0	21 0	24 6	19 6	21 6	19 0	19 0	17 0	10 6	10 6	14 0	12 6	14 0	12 6
1936		27 0	22 0	25 6	20 0	21 6	19 0	19 0	17 0	14 0	14 0	17 0	16 0	17 0	16 0
1937		39 0	35 0	38 0	33 6	34 6	32 0	34 6	31 6	26 0	26 0	32 0	29 0	32 0	29 0
1938		22 0	19 6	21 6	18 6	21 0	18 6	20 0	18 6	12 0	12 0	16 0	14 6	16 0	14 6
1939		26 0	22 0	25 6	21 6	24 0	21 6	23 6	21 6	15 0	15 0	21 0	19 0	21 0	19 0
1 1940		87 0	30 6	37 0	30 6	33 0	29 6	33 0	29 6	25 0	25 0	28 6	26 0	28 6	26 0
1 1941		42 0	35 6	42 0	35 6	37 6	34 0	37 6	34 0	29 0	29 0	33 0	30 0	33 0	30 0
1 1942		47 0	40 0	47 0	40 0	42 0	38 6	42 0	38 6	33 0	33 0	37 0	34 0	37 0	34 0

1 The prices given were prices fixed by Government, and not free market prices.

Premiums awarded by the Society, 1942.

VETERINARY DEPARTMENT.

CLASS EXAMINATIONS, 1942.

Silver Medals were awarded to the following :—

GLASGOW VETERINARY COLLEGE.

Chemistry	G. Young, Glasgow.
Biology	A. T. Dickie, Glasgow.
Senior Anatomy	Thomas C. Denholm, Glasgow.
Junior Anatomy	Alexander M'Kenzie, Balloch.
Physiology	Joan M. Wilson, London.
Zootechny	Jamesina Mackenzie, Torridon.
Pathology	Margaret B. Cooper, Ayr.
Hygiene	C. A. Hartman-Smith, Bearsden.
Surgery	I. C. Bryson, Motherwell.
Medicine	Andrew Miller, Kirtlebridge.
Histology	Catherine Mackenzie, Torridon.
Pharmacology	C. A. Hartman-Smith, Bearsden.
Parasitology	William Stewart, Girvan.

13 Large Silver Medals, £21, 18s. 2d.

ROYAL (DICK) VETERINARY COLLEGE.

Chemistry	J. B. Wilson, Nantwich.
Biology	J. B. Willson, Nantwich.
Senior Anatomy	L. J. P. Duncan, Aberdeen.
Junior Anatomy	G. Duncan, Blairgowrie.
Physiology	D. L. Grant, Tamworth.
Zootechny	D. L. Grant, Tamworth.
Pathology	R. R. A. Coombs, Cape Town.
Hygiene	P. D. I. Thomas, Skewen.
Surgery	R. S. Comline, Hawick.
Medicine	W. Tait, Dumfriesshire.
Histology	G. Duncan, Blairgowrie.
Pharmacology	L. J. P. Duncan, Aberdeen.
Parasitology	R. R. A. Coombs, Cape Town.

13 Large Silver Medals, £21, 18s. 2d.

LOCAL GRANTS, &c., 1942.

14 Districts—Grants of £15 each for Stallions engaged	£210	0	0
Special Grants: Medals, £20, 14s.	65	14	0
Medals for Scottish Gardens and Allotments Competition	2	2	6
3 „ Medals for Hoeing Competition, 1941-42	2	10	3
1 „ Medal for Ploughing, 1941-42	0	17	5
Long Service Certificates, £34, 7s. 7d.; and Silver Medals, £31, 19s. 6d. (1941-42)	66	7	1
	<hr/>		
	£347	11	3

ABSTRACT OF PREMIUMS.

Local Grants	£281	4	2
Long Service Awards	66	7	1
Veterinary Colleges (26 Medals)	43	16	4
	<hr/>		
	£391	7	7

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND

STATE OF THE FUNDS

AS AT 30TH NOVEMBER 1942

GENERAL FUNDS.

I. BRITISH GOVERNMENT SECURITIES—		
£25,000 8½ per cent War Loan, at 104½	£26,078	2 6
£1,679, 18s. 4d. 2½ per cent Consolidated Stock, at 82	1,877	6 6
£20,000 3½ per cent Conversion Loan, at 108½	21,312	10 0
£2,500 3 per cent Do. do. at 103½	2,590	12 6
£5,000 3 per cent Funding Loan, at 101	5,050	0 0
£1,000 3 per cent Defence Bonds, at 102½	1,027	10 0
£10,000 3 per cent War Loan, at 102½	10,206	5 0
£2,300 3 per cent Savings Bonds, 1955-65, at 101	2,323	0 0
	£69,965	6 6
II. HERITABLE BOND—		
£2,500 at Commissioners' Rates	2,500	0 0
III. RAILWAY DEBENTURE AND PREFERENCE STOCKS—		
£17,050 London and North-Eastern Railway		
Co. 3 per cent Debenture Stock, at 83	£14,151	10 0
£11,554 Do. do. 4 per cent do., at 106	12,247	4 10
£16,105 London Midland and Scottish Railway		
Co. 4 per cent Debenture Stock, at 107	17,232	7 0
£1,500 Do. do. 4 per cent		
Preference Stock, at 75½	1,132	10 0
£708 Southern Railway Co. 4 per cent Debenture Stock, at 112½	790	17 6
£450 Do. do. 5 per cent Preference Stock, at 110	495	0 0
£112 Do. do. 5 per cent Guaranteed Preference Stock, at 126½	141	13 7
	46,191	2 11
IV. BANK STOCKS—		
£5,365 0 0 Royal Bank of Scotland Stock, at 455 x.d.	£24,410	15 0
£2,218 16 5 Bank of England Stock, at 370	8,209	12 10
£1,777 0 0 Bank of Scotland Stock, at 62s.	5,508	14 0
£2,850 0 0 Barclays Bank Ltd. "B" Stock, at 75s. 6d.	10,758	15 0
	48,887	16 10
V. COLONIAL GOVERNMENT STOCKS—		
£2,000 Western Australia 4 per cent Inscribed Stock (1942-62), at 100	£2,000	0 0
£2,000 New Zealand Government 5 per cent Inscribed Stock (1946), at 102½	2,055	0 0
£1,120 Victorian Government 3½ per cent Consolidated Inscribed Stock (1929-49), at 98	1,097	12 0
	5,152	12 0
VI. CORPORATION MORTGAGE—		
£5,000 on Loan to Edinburgh Corporation at 4 per cent, maturing Martinmas 1944	5,000	0 0
VII. TEMPORARY LOAN—		
£2,000 on Loan to Edinburgh Corporation	2,000	0 0
VIII. ESTIMATED VALUE OF BUILDING—		
8 Eglinton Crescent, Edinburgh	5,000	0 0
IX. ESTIMATED VALUE OF FURNITURE, PAINTINGS, BOOKS, &c.		
	1,500	0 0
Carry forward	£186,196	18 3

	Brought forward	£186,196 18 3
X. ARREARS OF SUBSCRIPTIONS considered recoverable		282 8 0
XI. BALANCES at 30th November 1942		562 0 8
AMOUNT OF GENERAL FUNDS		<u>£187,041 6 6</u>

SPECIAL FUNDS.

TWEEDDALE GOLD MEDAL FUND—

£805 London and North-Eastern Railway Co. 4 per cent Debenture Stock, at 106 .		£641 6 0
£100 3 per cent Local Loans Stock, at 96½ .		96 16 3
Sum on Deposit Receipt with British Linen Bank .		73 13 8
		<u>£811 15 11</u>

FIFE AND KINROSS PERPETUAL GOLD CHALLENGE CUP FUND—

£268 London and North-Eastern Railway Co. 3 per cent Debenture Stock, at 83 .	£222 8 10	
£201 Do. do. 4 per cent First Guaranteed Stock, at 96 .	192 19 2	
Sum on Deposit Receipt with British Linen Bank .	108 4 9	
		<u>518 12 9</u>

PAISLEY PERPETUAL GOLD CHALLENGE CUP FUND—

£302 London and North-Eastern Railway Co. 3 per cent Debenture Stock, at 83 .	£665 13 4	
£100 3 per cent Savings Bonds, 1955-65, at 101 .	101 0 0	
Sum on Deposit Receipt with British Linen Bank .	73 19 2	
		<u>840 12 6</u>

RENFREWSHIRE PERPETUAL GOLD CHALLENGE CUP FUND—

£668 London and North-Eastern Railway Co. 3 per cent Debenture Stock, at 83 .	£554 8 10	
£100 3 per cent Savings Bonds, 1955-65, at 101 .	101 0 0	
Sum on Deposit Receipt with British Linen Bank .	69 18 1	
		<u>725 6 11</u>

WILLIAM TAYLOR MEMORIAL PRIZE FUND—

£401 London and North-Eastern Railway Co. 3 per cent Debenture Stock, at 83 .	£332 16 8	
£100 3 per cent Savings Bonds, 1955-65, at 101 .	101 0 0	
Sum on Deposit Receipt with British Linen Bank .	58 0 1	
		<u>491 16 9</u>

WILLIAM DUTHIE PERPETUAL SILVER CHALLENGE CUP FUND—

£260 2½ per cent Consolidated Stock, at 82 .	£213 4 0	
Sum on Deposit Receipt with British Linen Bank .	19 12 3	
		<u>232 16 3</u>

THE JAMES ARCHIBALD PRIZE—

£612, 1s. 6d. 3½ per cent War Loan, at 104½ .	£638 9 5	
Sum on Deposit Receipt with Royal Bank of Scotland .	54 3 2	
		<u>692 12 7</u>

KINMONTH GOLD QUACH FUND—

£46, 13s. 6d. 3½ per cent War Loan, at 104½ .	£48 13 4	
Sum on Deposit Receipt with British Linen Bank .	4 15 0	
		<u>53 8 4</u>

AMOUNT OF SPECIAL FUNDS		<u>£4,367 2 0</u>
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EDINBURGH, 6th January 1943.—As Auditor of the Highland and Agricultural Society of Scotland, I have examined the Securities for the Investments as detailed in the above State of the Funds and have found them in order. The Titles to the Heritable Estate and the Bond for Sum lent on Heritable Security are certified by the Society's Law Agents to be in order.

GEO. JAMES GREGOR, C.A.

HOME, Treasurer.

F. J. CARRUTHERS, Hon. Secretary.

ABSTRACT of the ACCOUNTS of the HIGHLAND and

CHARGE.

1. BALANCES at 30th November 1941	£1,522 17 3	
2. ARREARS of Subscriptions outstanding at 30th November 1941	4537 19 0	
Whereof due by Members who have compounded for life, and whose arrears are thereby extinguished.	52 1 0	
		485 18 0
3. INTEREST AND DIVIDENDS—		
(1) Interest—		
On Heritable Bond, less Income-tax	£43 15 0	
On Railway Debenture and Preference Stocks, do.	867 0 8	
On Colonial Government Stocks, do.	109 12 0	
On British Government Stocks, do.	1,562 9 8	
On Mortgage, do.	100 0 0	
On Temporary Loans, do.	7 9 1	
On Deposit Receipts	3 2 8	
	£2,693 8 8	
(2) Dividends on Bank Stocks, less Income-tax	886 7 10	
		3,579 16 6
4. SUBSCRIPTIONS—		
Annual Subscriptions	£1,611 14 6	
Life Subscriptions	1,113 0 0	
		2,724 14 6
5. 'TRANSACTIONS'—Miscellaneous Sales and other Receipts	33 1 9	
6. INCOME-TAX repaid for year to 5th April 1942	2,653 16 0	
7. N.D.D. EXAMINATION at Ayr, 1941—Refund of Expenses	180 8 10	
8. DEPOSIT Receipts uplifted	1,000 0 0	
9. MISCELLANEOUS	3 5 7	
SUM OF CHARGE	£12,183 18 5	

EDINBURGH, 6th January 1943.—As Auditor of the Highland and Agricultural of the Society for the year ending 30th November 1942 and have found them to be Accounts I have prepared an Account of Charge and Discharge of the Intromissions 1942, of which the above is an Abstract.

AGRICULTURAL SOCIETY of SCOTLAND for Year 1941-1942.

DISCHARGE.

1. ESTABLISHMENT EXPENSES—

Salaries and Wages and Allowance for Cleaning	£3,130 16 0
Allowance to Mrs Cowie	100 0 0
Feu-duty, £14, 11s. 8d.; Rates and Taxes, £109, 14s. 0d.	124 5 8
Coal, Gas, and Electric Light	66 12 10
Insurances, £48, 8s. 3d.; War Damage Insurance (Business), £84, 10s. 6d.; Special Annuity Premium, £51, 3s. 9d.; Superannuation Scheme, £132, 18s. 0d.; Telephone and Telegrams, £52, 2s. 5d.; Repairs and Furnishings, £41, 1s. 7d.	410 5

£3,832 0 6

2. FEE to Auditor of Accounts for 1940-1941 120 0 0

3. EDUCATION—N.D.A. Examination, 1942 100 19 8

4. CHEMICAL DEPARTMENT—

Fee to Chemist	100 0 0
Analyses for Members and Expenses	172 11 10
	272 11 10

5. VETERINARY DEPARTMENT—Medals to Students 43 16 4

6. DAIRY DEPARTMENT—N.D.D. Examination, 1941 108 14 11

7. DAIRY DEPARTMENT, 1942—

Expenses of N.D.D. Examination held at Ayr	£269 8 9
Less Entry Fees	112 7 0
	157 1 9

8. SOCIETY'S 'TRANSACTIONS' 1,283 9 7

9. ORDINARY Printing, £85, 2s. 6d.; Advertising, £42, 14s. 9d.; Stationery,
Books, &c., £79, 18s. 0d.; Postages and Receipt Stamps, £105, 0s. 7d. 292 15 10

10. RETIRING Allowance to Professor Stanfield, Consulting Engineer 150 0 0

11. AIR RAID PRECAUTIONS 6 19 8

12. MISCELLANEOUS Payments 265 3 4

13. GRANTS to Local Societies, 1941 378 4 11

14. CERTIFICATES and Medals for Long Service 81 9 4

15. SPECIAL GRANTS—

Animal Diseases Research Association, £200; Glasgow Veterinary College, £100; Scottish Agricultural Organisation Society, £100; Scottish Red Cross Agriculture Fund, £128, 4s. 9d.; other Grants, £97, 2s. 6d.	625 6 9
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16. EXPENSES in connection with Show Plant, &c. 55 6 3

17. TEMPORARY LOANS—Lodged £2,500 0 0
Less Uplifted 2,500 0 0

0 0 0

18. INVESTMENT made—Cost of £2,300 3% Savings Bonds, 1955-65 2,300 0 0

19. PLACED on Deposit Receipt 1,000 0 0

20. ARREARS removed from Subscription List at 30th November 1942 265 9 6

21. ARREARS of Subscriptions outstanding at 30th November 1942 282 8 0

22. BALANCES at 30th November 1942—

On Account Current with Royal Bank of Scotland—	
Edinburgh Account	£527 19 2
In hands of Secretary	34 1 1
	562 0 8

SUM OF DISCHARGE £12,133 18 5

Society of Scotland, I beg to report that I have examined the Books and Accounts correctly stated and sufficiently vouched and instructed. From the Books and of the Treasurer with the Funds of the Society for the year ending 30th November
GEO. JAMES GREGOR, C.A.

HOME, Treasurer.

F. J. CARRUTHERS, Hon. Secretary.

ABSTRACT of the ACCOUNTS of the CHARGE.

I. FUNDS at 30th November 1941—

£3,193 London and North-Eastern Railway Company 3 per cent Debenture Stock	£2,650 0 0
£5,551, 16s. 3d. 3½ per cent Conversion Stock	4,216 18 2
£500 Queensland 3½ per cent Inscribed Stock, 1950-70	450 1 0
£412 London Midland and Scottish Railway Company 4 per cent Debenture Stock	611 10 6
£190 London Midland and Scottish Railway Company 4 per cent Guaranteed Stock	259 1 11
	<u>£8,187 11 7</u>

BALANCES with Royal Bank of Scotland—

On Account Current	£403 8 10
On Deposit Receipt	200 0 0
	<u>603 8 10</u>
	<u>£8,791 0 5</u>

II. INTEREST ON INVESTMENTS—

On £3,193 London and North-Eastern Railway Company 3 per cent Debenture Stock, for year to 30th June 1942	£95 15 10
Less tax	47 17 11

£47 17 11

On £5,551, 16s. 3d. 3½ per cent Conversion Stock, for year to 1st October 1942	£194 6 2
Less tax	97 3 0

97 3 2

On £500 Queensland 3½ per cent Inscribed Stock, 1950-70, for year to 1st July 1942	£17 10 0
Less tax	8 15 0

8 15 0

On £412 London Midland and Scottish Rail- way Company 4 per cent Debenture Stock, for year to 30th June 1942	£16 9 6
Less tax	8 4 9

8 4 9

On £190 London Midland and Scottish Rail- way Company 4 per cent Guaranteed Stock, for year to 30th June 1942	£7 12 0
Less tax	3 16 0

3 16 0

On £400 3 per cent Savings Bonds, 1955-65, from 6th December 1941 to 15th August 1942	£8 6 8
Less tax	4 3 4

4 3 4

III. INTEREST ON DEPOSIT RECEIPTS	170 0 2
IV. INCOME-TAX repaid for year to 5th April 1942	167 0 1

SUM OF CHARGE
£9,129 9 8

ARGYLL NAVAL FUND for the Year 1941-1942.

DISCHARGE.

I. ALLOWANCES to seven Recipients—

7 at £40 each	£280 0 0
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II. INVESTMENT made—

£400 3 per cent Savings Bonds, 1955-65, at par	<u>£400 0 0</u>
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III. FUNDS at 30th November 1942—

£3,198 London and North-Eastern Railway Company 3 per cent Debenture Stock .	£2,650 0 0
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£5,551, 16s. 3d. 3½ per cent Conversion Stock .	4,216 18 2
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£500 Queensland 3½ per cent Inscribed Stock, 1950-70	450 1 0
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£412 London Midland and Scottish Railway Company 4 per cent Debenture Stock .	611 10 6
--	----------

£190 London Midland and Scottish Railway Company 4 per cent Guaranteed Stock .	259 1 11
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£400 3 per cent Savings Bonds, 1955-65 . . .	400 0 0
	<u>£8,587 11 7</u>

Note.—The above Funds are entered at cost price. The market value at 30th November 1942 was £10,089, 8s. 8d.

Balances with Royal Bank of Scotland—

On Account Current . . .	£65 14 4	
On Deposit Receipt . . .	<u>196 3 9</u>	
		<u>261 18 1</u>
		8,849 9 8

SUM OF DISCHARGE . . .	<u>£9,129 9 8</u>
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HOME, *Treasurer.*
F. J. CARRUTHERS, *Hon. Secretary.*
GEO. JAMES GREGOR, C.A., *Auditor.*

VIEW OF RECEIPTS AND PAYMENTS for Year 1941-1942.

RECEIPTS.

INTEREST AND DIVIDENDS	£3,579 16 6
INCOME TAX REPAYED for year to 5th April 1942	2,653 16 0
	£6,233 12 6
ANNUAL SUBSCRIPTIONS AND ARREARS received	1,549 15 0
	£7,783 7 6

PAYMENTS.

ESTABLISHMENT EXPENSES (see page 183)	£3,832 0 6
FEE TO AUDITOR for 1940-1941	120 0 0
CHEMICAL DEPARTMENT	272 11 10
VETERINARY DEPARTMENT	43 16 4
EDUCATION	186 7 6
RETIRING ALLOWANCE TO CONSULTING ENGINEER	150 0 0
SOCIETY'S 'TRANSACTIONS'	1,250 7 10
ORDINARY Printing, Stationery, Advertising, and Miscellaneous Accounts	616 19 6
GRANTS TO LOCAL SOCIETIES, &c.	459 14 3
	£6,931 17 9

Extraordinary Expenditure—

Special Grants (see page 183)	625 6 9	
		7,557 4 6
SURPLUS		£226 3 0

Extraordinary Income—

Life Subscriptions	1,113 0 0
EXCESS OF RECEIPTS	£1,339 3 0

HOME, *Treasurer.*F. J. CARRUTHERS, *Hon. Secretary.*GEO. JAMES GREGOR, C.A., *Auditor.*

EDINBURGH, 6th January 1943.

PROCEEDINGS AT BOARD MEETINGS.

MEETING OF DIRECTORS, 1st APRIL 1942.

Major R. F. BREBNER, The Leuchold, Dalmeny House, Edinburgh, in the Chair.

Present.—Ordinary Directors—Mr R. Scott Aiton; Mr David Blair; Major R. F. Brebner; Mr Alexander Clark; Mr James Durno; Mr Peter Gordon; Mr George Grant; Mr James Hope; Mr James R. Lumsden; Mr Finlay MacGillivray; Mr Thomas M'Lay; Mr Robert Park; Mr James Paton; Mr T. Mercer Sharp; Major Robert W. Sharpe; Mr John P. Sleigh; Mr J. Faed Sproat; Mr T. G. Wilson. *Extraordinary Directors*—Mr Alexander Cormack; Mr William I. Elliot; Mr William Montgomery; Sir Joshua Ross-Taylor. *Treasurer*—The Earl of Home, K.T. *Honorary Secretary*—Colonel F. J. Carruthers of Dormont.

The late Duke of Atholl, K.T.

Before proceeding with the business of the Meeting, the Chairman referred, with deep regret, to the death, on 15th March, of His Grace The Duke of Atholl, K.T. For nearly forty years, he said, His Grace was a member of the Society, and served as an Ordinary Director for eleven years, from 1906 to 1913 and again from 1922 to 1925. He was President of the Society in 1924, the year of the Perth Show, and Vice-President on three occasions—1904, 1931, and 1933. In the latter year he acted as Convener of the Local Committee in connection with the very successful Show at Dundee.

As a soldier, as a landed proprietor, and as the holder of many distinguished public offices the late Duke rendered conspicuous service to his country, and was held in the highest public esteem. He was always ready to lend his powerful influence to any movement to promote the welfare of Scotland, and especially of the Highlands. As a landed proprietor he took a keen practical interest in agriculture and in the welfare of the tenants on his extensive estates. In his death Agriculture and the Society had lost a staunch supporter, and the Nation had lost one of the foremost Scotsmen of his time.

A Minute of regret and sympathy was submitted and adopted, the members present upstanding, and the Secretary was instructed to forward a copy to the Duchess of Atholl.

The late Mr J. Harling Turner, C.B.E.

The Chairman said it was also with deep regret that he had to refer to the death of a former member of that Board, Mr J. Harling Turner, C.B.E.; Portland Estate Office, Kilmarnock. Mr Turner, he said, was a member of the Society for the long period of fifty-eight years, an Ordinary Director from 1889 to 1892, and an Extraordinary Director on four occasions—1888, 1905, 1913, and 1934.

During his long life Mr Turner was associated with many public activities, and left behind him a notable record of public service. Amongst these activities might be mentioned the Convenership of the County of Ayr and the Chairmanship of the Governors of the West of Scotland Agricultural College. During his period of office in the latter capacity he guided the affairs of the College through a most difficult period, and it was largely through his efforts that money was raised for the equipment of the Dairy School and Experimental Farm at Auchincruive.

As Commissioner on the Duke of Portland's estates in Scotland he displayed great skill and ability in the management of these estates, and his deep interest in agricultural affairs and consideration for the welfare of the tenants rendered him respected and esteemed by the farming community.

A Minute of regret and sympathy was submitted and adopted, the members present

upstanding, and the Secretary was instructed to forward a copy to the family of the deceased.

Vacancies on Board.

It was remitted to the Ordinary Directors in the Border Show Division to nominate at next meeting a director to fill the vacancy caused by the death of the late Mr Thomas Templeton.

With regard to the vacancy in the Inverness Show Division, caused through the death of the late Mr D. A. MacLennan, Balmachree, the Secretary reported that, at a meeting of members in Inverness on 24th February, Mr Ralph S. MacWilliam, Garguston, Muir of Ord, was nominated to fill the vacancy. This procedure was followed, as the late Mr MacLennan, at the time of his death, had not actually been elected a director although he had been duly nominated.

Inspection of Growing Crops of Potatoes.

Mr James Paton, Kirkness, Glencraig, submitted a report on the proceedings at a Conference in connection with the Scheme for the Inspection of Growing Crops of Potatoes, held at St Andrew's House, Edinburgh, on 15th January.

In submitting the report, Mr Paton said the Ministry of Agriculture had suggested that they should have a uniform standard for seed potatoes grown in England and in Scotland. As the Scottish standard was much higher than the English, they thought this would result in reducing the standard for Scottish potatoes. They did not think that any change should take place in the meantime, but if, after the war, a change should take place, the standard for the United Kingdom should be brought up to the Scottish standard.

In moving a vote of thanks to Mr Paton, the Chairman said it was an excellent report, and contained a lot of interesting and valuable information.

Stock Health and Pasture Improvement Association.

A letter was read from Lord Glentanar inviting the Society to nominate a member with a view to joining the Stock Health and Pasture Improvement Association (North-East of Scotland).

On the motion of Mr James Durno, Crichtie, it was agreed to nominate Mr G. H. Russell of The Burn as a member of the Association.

Abolition of White Bread.

Letters were submitted from Mr Allan Barns-Graham of Lymekilns, &c., and also copies of a printed booklet, in which he expressed the view that the recent Cabinet decision to abolish white bread should be reversed, and, if necessary, white bread should be rationed. He stressed the point that the whole of the offal (bran and thirds) from our home-grown wheat should be strictly reserved for the production of milk, meat, bacon, and eggs, and also the first-class farmyard manure which was required to secure our maximum production of wheat, oats, &c.

The Chairman said that, without the full information regarding world conditions which was available to the Ministries of Food, Agriculture, and Shipping, it would be most injudicious, he thought, for the Board to express a view arrived at by the Cabinet.

After some discussion, it was decided that no action be taken.

Animal Diseases Research Association.

An application was submitted from the Animal Diseases Research Association for a renewal of the grant of £200 for the current year.

On the recommendation of the Finance Committee, it was agreed that the grant be renewed.

Glasgow Veterinary College.

An application for a renewal of the grant of £100 for the current year to the Glasgow Veterinary College was submitted, and it was decided, on the recommendation of the Finance Committee, that the grant be renewed.

Post-war Agricultural Education.

The Secretary reported the receipt of a letter, dated 4th March, from the Department of Agriculture for Scotland inviting the Society to appoint representatives to attend a Conference on the subject of Post-war Agricultural Education to be held on 24th March. The Society was represented at the Conference by Major R. F. Brebner, Chairman of Directors; Colonel F. J. Carruthers, Convener of the Education Committee; and by the Secretary.

Colonel Carruthers gave a short report on the proceedings at the Conference. The general opinion, he said, appeared to be that no instruction should be given to pupils in Agriculture or in Horticulture until after leaving school, and that no technical education should be given until after the age of eighteen.

Hill Sheep Enquiry.

A Statement of the Evidence to be given by the Society's representatives before the Committee of Enquiry regarding Hill Sheep Farming was considered in detail. Copies of the Statement had been circulated to members of the Board.

A full discussion took place, as a result of which various suggestions were received regarding additional points which might be dealt with.

Finance.

A Minute of Meeting of Finance Committee, dated 1st April, was submitted and approved.

The Minute dealt, *inter alia*, with the recommendation that the expenses incurred in connection with the activities of the Scottish Red Cross Agriculture Fund Committee, during its second year, amounting to a sum of £128, 4s. 9d., be defrayed by the Society.

MEETING OF DIRECTORS, 3RD JUNE 1942.

Major R. F. BREBNER, The Leuchold, Dalmeny House, Edinburgh, in the Chair.

Present.—Ordinary Directors—Mr R. Scott Aiton; Mr J. W. Alexander, M.V.O.; Major R. F. Brebner; Mr James Clark; Mr James Durno; Mr Peter Gordon; Mr James Kilpatrick; Mr James R. Lumsden; Mr Finlay MacGillivray; Mr Thomas M'Lay; Mr Alexander Murdoch; Mr Robert Park; Mr James Paton; Mr G. H. Russell; The Hon. Walter T. H. Scott, Master of Polwarth; Mr T. G. Wilson; Mr James Wyllie. *Extraordinary Directors*—Mr Alexander Cormack; Mr Peter W. Crawford; Mr William I. Elliot; Mr A. W. Montgomerie; Mr William Montgomery; Sir Joshua Ross-Taylor; Major Sir Samuel Strang Steel, Bt. *Honorary Secretary*—Colonel F. J. Carruthers of Dormont.

Vacancy on Board.

On behalf of the Ordinary Directors in the Border Show Division, Mr R. Scott Aiton, M.C., Legerwood, moved that Mr Matthew Templeton, Kelso, be nominated at the Half-yearly General Meeting that afternoon as an Ordinary Director to fill the vacancy caused by the death of his brother, the late Mr Thomas Templeton, Sandyknowe.

The Motion was seconded by Sir Joshua Ross-Taylor, and unanimously agreed to.

Scottish Red Cross Agriculture Fund.

The Chairman said the Report on the activities of the Scottish Red Cross Agriculture Fund Committee during its second year—17th April 1941 to 16th April 1942—had been circulated to members of the Board. As a Report would be submitted to the Half-yearly General Meeting that afternoon, he did not propose to deal with it there. He wished, however, to convey to the Directors of the Society the cordial thanks of the Committee for defraying the cost of the scheme during the past year. (For fuller details, see Report of Half-yearly General Meeting of 3rd June 1942.)

Abolition of White Bread.

Further letters from Mr Allan Barns-Graham of Lymekilns, &c., dated 23rd and 28th April and 4th May, were submitted, together with a copy of a booklet 'The Abolition of White Bread.' There was also submitted a letter from Mr Barns-Graham's Solicitors, Messrs Dixon, Erskine & Company, Glasgow.

In the correspondence and booklet Mr Barns-Graham stressed the following points: (1) that bean meal and "mashlam" should be rationed so that all cows in milk be given the chance of producing their maximum milk yield; and (2) that farmers who can grow beans and "mashlam" should sell at a reasonable price (what they do not require for their own use) to the dairy farmers who cannot grow them.

In the course of discussion which followed, Mr T. G. Wilson pointed out that the suggestion that farmers who can grow beans should make these available to dairy farmers who cannot grow them was not new. Representations to this effect had been made to the Department of Agriculture for Scotland months previously.

It was decided to take no action in the matter.

Scottish Land Settlement Committee.

A letter was submitted, dated 6th April, from the Secretary of the Scottish Land Settlement Committee, which had been constituted by the Secretary of State for Scotland with the following terms of reference:—

"To review the operation of Land Settlement Schemes in Scotland, and, in the light of the results achieved, to advise what changes in the system of tenure or of existing methods of land settlement are desirable, with particular reference to the social and economic welfare of smallholders and crofters."

The letter stated that the Committee would be glad to know if the Society would care to place before them any views on the subject of inquiry.

After discussion, it was decided that the following representative Committee be appointed to draw up a statement for submission to the Committee: Mr Ian M. Campbell, Mr James Durno, Mr James R. Lumsden, Mr James Paton, Sir Joshua Ross-Taylor, Mr James Wyllie, with the Chairman, Treasurer, and Hon. Secretary, *ex officio*.

Animal Diseases Research Association.

The Chairman, in the absence of the Treasurer, moved that the Board confirm the proposed grant of £200 for the current year to the Animal Diseases Research Association, and this was unanimously agreed to.

Glasgow Veterinary College.

The Chairman also moved confirmation of the proposed grant of £100 for the current year to the Glasgow Veterinary College, and this was unanimously agreed to.

Farm Valuations under the 1942 Finance Act.

Reference was made to the statement made by the Chancellor of the Exchequer in announcing the withdrawal of the farmers' option to pay income tax on a rental basis on all farms whose rents exceed £100 per annum. In that statement the Chancellor said that it was desirable to consider the method of application of the general income tax principle of valuation in such matters as the valuation of live stock bred on the farm, and cultivations, tillages, unexhausted manures, and growing crops, and the Inland Revenue authorities proposed to consult with the agricultural departments and the representatives of the farming industry so as to ensure that the methods of valuation were suitable for present farming conditions.

From reports in the Press, it appeared that representatives of the National Farmers' Union and Chamber of Agriculture of Scotland had been consulted by the Inland Revenue authorities with regard to this point, but no opportunity had been offered to the Society to submit its views.

On the motion of Mr R. Scott Aiton, seconded by Mr James Paton, it was decided that representation be made to the income tax authorities that the views of the Society should be heard before arriving at any decision.

It was further decided that the Committee appointed in November 1941 to consider the question of Farmers' Income and Excess Profits Tax be reappointed as a Committee, with powers, to draw up representations on behalf of the Society. The name of Mr E. A. Bell, Ayr, was added to the Committee for this special purpose.

Finance.

A Minute of Meeting of Committee, dated 3rd June, was submitted and approved.

The Minute dealt, *inter alia*, with the following matters:—

Glasgow and West of Scotland S.P.C.A.—It was recommended that a grant of £10 be given to the Glasgow and West of Scotland Society for the Prevention of Cruelty to Animals for the current year.

Edinburgh Highland Reel and Strathspey Society.—It was recommended that the grant of £50, together with the additional grant of £25 given during the past two years, be renewed for the current year.

Staff Salaries.—It was recommended that the following war bonuses be paid to the following members of the Society's staff, these to take effect as from 1st June: Mr John Watt, £50 per annum; Mr J. J. Blake, 10s. weekly; Miss A. T. Maitland, 10s. weekly; Miss C. S. Stirton, 10s. weekly.

MEETING OF DIRECTORS, 4TH NOVEMBER 1942.

Major R. F. BREBNER, The Leuchold, Dalmeny House, Edinburgh, in the Chair.

Present.—Ordinary Directors—Major R. F. Brebner; Major A. D. Campbell; Mr W. J. Campbell; Mr Alexander Clark; Mr Peter Gordon; Mr George Grant; Mr William Hodge; Mr J. E. Kerr; Mr James Kilpatrick; Mr William H. Lawson; Mr James R. Lumsden; Mr Thomas M'Lay; Mr Ralph S. MacWilliam; Mr Alexander Murdoch; Mr James Paton; Mr John N. Reid; Sir Joshua Ross-Taylor; Mr T. Mercer Sharp; Major Robert W. Sharpe; Mr John P. Sleigh; Mr J. Paed Sproat; Mr Matthew Templeton; Mr James Wyllie. *Extraordinary Directors*—Mr R. Scott Aiton; Mr J. W. Alexander, M.V.O.; Mr Peter W. Crawford; Mr James Durno. *Treasurer*—The Earl of Home, K.T. *Honorary Secretary*—Colonel F. J. Carruthers of Dormont.

The late Sir Hugh Shaw-Stewart, Bt.

Before proceeding with the business of the Meeting, the Chairman referred, with very deep regret, to the death of Sir Hugh Shaw-Stewart of Greenock and Blackhall, Bt., K.C.B., a former Chairman of Directors and Honorary Secretary of the Society.

Sir Hugh's connection with the Society, he said, extended over a period of sixty-three years. He first joined the Board as a Director in 1912, and was Chairman of the Board during the years 1922 and 1923. He also filled the office of Vice-President on two occasions—in 1931 and 1934. In June 1924, on the death of the late Dr Charles Douglas, Sir Hugh was appointed Honorary Secretary of the Society, an office which he filled up till the date of his resignation—January 1929.

At that time the Directors placed on record their appreciation of the valuable services rendered by Sir Hugh to the Society, not only during the four years in which he had filled the office of Honorary Secretary, but during the sixteen years in which he had been a member of the Board, including the two years in which he was Chairman.

Besides his work for that Society Sir Hugh gave notable service on many public bodies. As Lord-Lieutenant of the County of Renfrew during the past twenty years, he gave ungrudging service to the public, and was an active supporter of every movement for the common good. Besides his deep interest in Agriculture, he took a keen interest in Dairying and in Forestry, having filled the office of President of the Ayrshire Cattle Herd Book Society and President of the Royal Scottish Forestry Society. In all these activities his sound judgment, his unfailing courtesy, and his great kindness of manner rendered him respected and esteemed by all with whom he was associated.

A Minute of regret and sympathy was submitted and adopted, the members present upstanding, and the Secretary was instructed to forward a copy to the relatives of the deceased.

The late Master of Polwarth.

The Chairman also referred, with very deep regret, to the death, since last Meeting, of an esteemed colleague on the Board, the Hon. Walter T. H. Scott, Master of Polwarth.

The Master of Polwarth, he said, first joined the Board of Directors in 1925 as an Extraordinary Director. Thereafter, in 1927, he was elected an Ordinary Director of the Society, and served continuously on the Board from that date till the time of his death. He took a keen interest in the affairs of the Society, and acted for eleven years as an Assistant Steward of Stands in connection with the Annual Show.

He was well known and esteemed as a sheep farmer in the Border district, and was a member of the Special Committee on Hill Sheep Farming set up last year by the Secretary of State for Scotland. Besides his farming interests he gave valuable service to the country in the Army, in Local Government affairs, and on various public bodies. In all these activities his faithful and efficient service and unselfish disposition gained for him popularity and esteem by all classes.

A Minute of regret and sympathy was submitted and adopted, the members present upstanding, and the Secretary was instructed to forward a copy to the widow and family of the deceased.

The late John MacLachlan of MacLachlan.

The Chairman further referred, with deep regret, to the death of John MacLachlan of MacLachlan, Argyllshire. The MacLachlan, he said, joined the Society in 1880, was an Extraordinary Director in 1918, and a Vice-President in 1934. He took a deep interest in the administration of the Argyll Naval Fund, having been a member of the Committee of the Fund since 1895 and Convener since 1925. In these capacities he rendered valuable service to the Society.

Apart from his services to that Society he rendered notable service in connection with public affairs in the County of Argyll. As Chief of the MacLachlan Clan he was held in the highest respect and esteem.

A Minute of regret and sympathy was submitted and adopted, the members present upstanding, and the Secretary was instructed to forward a copy to the family of the deceased.

Chairman of the Board for 1942-43.

Mr James Durno, Crichtie, Inverurie, moved that Major R. F. Brebner, The Leuchold, Dalmeny House, Edinburgh, be re-elected Chairman of the Board of Directors for another year. In doing so, Mr Durno said that Major Brebner had presided over the deliberations of the Board during the past two years with the greatest acceptance to them all. They appreciated what he had done not only for the Directors but for the Society.

The Motion was unanimously adopted, and Major Brebner was re-elected Chairman of the Board for the ensuing year.

In agreeing to accept office, Major Brebner thanked the Directors for the honour they had again done him.

Treatment of Swill.

A letter was submitted from Mr Brewis Anderson, Secretary of the Scottish Shorthorn Breeders' Association, forwarding copy of a letter sent by that Association to the Ministry of Agriculture with regard to the collection, treatment, and feeding of swill from Army Canteens, &c., to pigs. The letter stated that the present methods adopted under various official orders were quite inadequate to prevent the spread of foot-and-mouth disease from swill. The laxity in the correct treatment of swill prior to feeding was obvious. It was felt that the only effective method would be to instruct Local Authorities to collect the swill, under supervision, and to deal with it in central boiling plants before the swill was allowed into the hands of pig-feeders.

After discussion, the Secretary was instructed to write to the Secretary of State for Scotland to the effect that the Directors were in full sympathy with the views expressed by the Scottish Shorthorn Breeders, and desired to urge the necessity of something being done to remove the serious dangers which at present existed. They, however, recognised that there were practical difficulties in carrying out the suggested scheme on account of shortage of the necessary plant for boiling the swill and also on account of the difficulty of providing the necessary transport. They felt, therefore, that if it were found impracticable to provide central boiling depots, then some other means should be devised to ensure the proper treatment of swill before it reached the farmer or pig-feeder.

Scottish Red Cross Agriculture Fund.

The Secretary submitted a Report on the progress of the Fund during the period from 16th April, the close of the second year's activities, up to the date of that Meeting.

The Report stated that between 17th April and that date a sum of £32,233, 12s. 1d. had been received, comprising Free Gift Sales, £25,050, 6s. 2d.; Voluntary Levies and Collections, £585, 16s. 6d.; Victory Garden Shows and Sales, £3241, 15s. 11d.; Other Contributions, £3118, 11s. 3d.; and Farm Workers' Contributions, £237, 2s. 3d.

The Earl of Home, K.T., in moving adoption of the Report, said it was a very satisfactory one. The response throughout the country had been magnificent.

Future of Agriculture.

A meeting of the Agricultural Policy Committee, dated 4th November, was submitted and approved.

The Minute stated that the Committee had given consideration to Notes prepared by the Chairman of Directors, and which had been circulated to the members. After some discussion, it was decided that further consideration be deferred until another Meeting.

'Transactions.'

A Minute of Meeting of Publications Committee, dated 4th November, was read and approved.

The Committee recommended that a volume of 'Transactions,' in a strictly limited form, be issued in 1943, provided it were possible to secure a licence for the necessary paper from the Paper Control.

Education.

Luzmoore Committee on Agricultural Education.—A Minute of Meeting of Education Committee, dated 12th October, was submitted and approved.

The Minute reported that a statement with regard to the N.D.A. Examination had been prepared and forwarded to Mr Turner for transmission to the Secretary of the Luzmoore Committee.

Prisoners of War.—A Minute of Meeting of Education Committee, dated 12th October, was submitted and approved.

The Minute referred to correspondence which had passed between Mr Turner and Miss Herdman, Secretary of the Prisoners of War Department of the Red Cross, Oxford. From the correspondence it appeared that certain prisoners of war in Germany were desirous of being allowed to sit for the theoretical parts of the N.D.A. Examination while they were in prison camps. The Committee had informed Mr Turner that they were in favour of the proposed scheme, that where the usual certificates regarding preliminary scientific training were not obtainable a certificate from a lecturer in a prisoner of war camp, that the candidate was, in his opinion, qualified to take the Examination, should be accepted, and that any question of payment of fees for the Examination should be left in abeyance till after the war, when the candidate would appear for the remainder of the Examination.

Control of Animal Diseases.

The Secretary reported that, on 5th August, the Society received an invitation to send a representative to a Conference, on 12th August, convened by the National Farmers' Union and Chamber of Agriculture of Scotland, for the purpose of considering the introduction of a scheme for the control of the four Animal Diseases—Mastitis, Sterility, Contagious Abortion, and Johne's Disease.

The Society was represented at the Conference by the Chairman of Directors, Major R. F. Brebner. Besides representatives of the N.F.U. and Chamber, there were present representatives of the Ministry of Agriculture, the Department of Agriculture for Scotland, the National Veterinary Medical Association, and the three Milk Marketing Boards in Scotland.

As a result of the deliberations at the Conference agreement was reached in regard to the introduction of a scheme for the control of the four main animal diseases above mentioned. Full details of the scheme were to be announced later.

Hill Sheep Subsidy.

The Secretary reported the receipt of an invitation from the National Farmers' Union and Chamber of Agriculture of Scotland to a Conference of the Hill Sheep interests held on 28th October. Major R. F. Brebner, Chairman of Directors, represented the Society at the Conference.

Major Brebner said that the matter was still under consideration, so that he was unable to make any statement at that time.

Scottish Land Settlement Committee.

A Minute of Meeting, dated 9th September, of the Special Committee on Land Settlement appointed by the Directors in June was submitted and approved.

The Minute reported that a Statement of Evidence, for submission to the Scottish Land Settlement Committee, had been prepared and forwarded to the Secretary of the Committee. The following were appointed as the Society's representatives to appear before the Committee in support of the written evidence: Sir Joshua Ross-Taylor, Mr James Paton, Mr Ian M. Campbell, and Major R. F. Brebner.

Farm Valuations under the 1942 Finance Act.

A Minute of Meeting of the Special Committee on Farmers' Income Tax and Excess Profits Tax, dated 12th June, was submitted and approved.

The Minute gave particulars of the action which had been taken, in association with the National Farmers' Union and Chamber of Agriculture of Scotland, to submit the views of the Committee regarding Farm Valuations under the 1942 Finance Act to the Inland Revenue Authorities.

Artificial Insemination.

A letter from the Department of Agriculture for Scotland, dated 31st August, was submitted, in which it was stated that the Agricultural Improvement Council for Scotland had decided to appoint a small Committee to consider and report on the desirability of promoting artificial insemination in Scotland, and what steps, if any, should be taken in the matter. The Society was invited to nominate a representative to act as a member of the Committee.

The Secretary reported that he had replied that no Meeting of the Board would be held until 4th November. If the Department was to constitute the Committee before that date, Major Brebner, Chairman of Directors, would represent the Society.

The appointment of Major Brebner as the Society's representative on the Committee was confirmed.

Sir Joshua Ross-Taylor said it was surprising to find that such an important suggestion as artificial insemination in Britain should have been taken so quietly by the breeders in this country. He did not know how it was likely to be received by breeders, but, personally, he felt that it would be most unfortunate for Britain—certainly for Scotland—if this practice were to become general. His view was that if their scientific friends got artificial insemination thoroughly established in the country there would be no incentive for the ordinary man to carry on breeding. The breeding industry in Scotland would be very badly hit and the export trade would go to the wall.

Mr J. E. Kerr of Harviestoun, Dollar, supported the views expressed by Sir Joshua. He thought the Breed Societies should be invited to take action along with that Society, because if the practice became general there would be difficulty in keeping reliable registrations of stock in Herd and Stud Books.

After discussion, it was decided that a Committee be appointed to consider the matter, with power to confer with representatives of Breed Societies. The members of the Committee were as follows: Mr J. E. Kerr (*Convener*), Sir Joshua Ross-Taylor, Mr James Durno, Mr James Kilpatrick, Mr J. W. Alexander, M.V.O., Mr William H. Lawson, with the Chairman, Treasurer, and Honorary Secretary, *ex officio*.

Grass Sickness in Horses.

A letter was submitted from the National Farmers' Union and Chamber of Agriculture enclosing copy of a letter addressed by that body on 20th July to the Agricultural Research Council with regard to Grass Sickness in Horses. The letter stated that the Union and Chamber were not completely satisfied that research into this disease had

been pursued with the vigour which the situation demanded, and if any lack of funds was hindering those responsible for carrying out experiments, it was suggested that it should become a national issue.

The Chairman stated that an assurance had been received from the Director of the Animal Diseases Research Association that the investigation of the disease of Grass Sickness in Horses was in no way being hindered through lack of funds. Under these circumstances it was decided to take no action in the matter.

Presentation of Books to Library.

The Secretary reported that Mr William Berry of Tayfield, Newport, Fife, had very kindly presented to the Society eighteen volumes of the 'Transactions,' covering the period 1799 to 1841. This series included the first volume issued by the Society, which was now extremely rare.

The cordial thanks of the Society were accorded to Mr Berry for his handsome gift.

The Secretary also reported a gift of twenty-nine volumes from Dr R. Stewart MacDougall, these volumes being mainly on Natural History subjects.

The thanks of the Society were also accorded to Dr Stewart MacDougall for his generous gift.

Finance.

A Minute of Meeting of Committee, dated 4th November, was submitted and approved.

The Minute dealt, *inter alia*, with the following matters:—

Members' Subscriptions.—The Secretary reported that, at that date, the amount received from members in Life Subscriptions exceeded the amount at the corresponding date last year by over £137. There was, however, a falling-off in Annual Subscriptions of £218.

Scottish Agricultural Organisation Society, Ltd.—It was recommended that the grant of £100 to the Scottish Agricultural Organisation Society be again renewed for the year 1943.

Royal Scottish Agricultural Benevolent Institution.—An application was considered from the Royal Scottish Agricultural Benevolent Institution for an annual grant towards the funds of the Institution. The Committee pointed out that it would not be competent for the Directors to decide to give an annual grant, but they recommended that a grant of £100 be given for the year 1943.

As arising on the Minute, Mr R. Scott Aiton, M.C., Legerwood, Earlston, moved that the Finance Committee consider the question of allowing Lady Members to continue as Members of the Society without payment of subscriptions throughout the duration of the war.

After discussion, and on a vote being taken, Mr Scott Aiton's Motion was defeated by a substantial majority.

MEETING OF DIRECTORS, 6TH JANUARY 1943.

Major R. F. BREBNER, The Leuchold, Dalmeny House, Edinburgh, in the Chair.

Present.—*Ordinary Directors*—Major R. F. Brebner; Mr William Brown; Mr W. J. Campbell; Mr Alexander Clark; Mr Peter Gordon; Mr George Grant; Mr A. W. Howison; Mr J. E. Kerr; Mr William H. Lawson; Mr James R. Lumsden; Mr Thomas M'Leay; Mr Alexander Murdoch; Mr James Paton; Mr John N. Reid; Captain Ian S. Robertson; Sir Joshua Ross-Taylor; Mr G. H. Russell; Mr T. Mercer Sharp; Major Robert W. Sharpe. *Extraordinary Directors*—Mr R. Scott Aiton; Mr A. W. Montgomerie; Major Sir Samuel Strang-Steel, Bt. *Treasurer*—The Earl of Home, K.T. *Honorary Secretary*—Colonel F. J. Carruthers, C.B., of Dormont. *Auditor*—Geo. James Gregor, C.A. *Chemist*—Dr J. F. Tocher, D.Sc., LL.D., F.I.C.

Congratulations to Colonel F. J. Carruthers, C.B.

The Chairman said it was his pleasant duty, in his own name and in name of the Directors, to offer congratulations to Colonel F. J. Carruthers on the honour of Companion of the Bath conferred upon him by His Majesty the King. Colonel Carruthers, he said, had been a member of the Society since 1896, and had been on the Board of

Directors continuously since 1907. He was also Honorary Secretary of the Society and Chairman of the Education and Publications Committees. He thought they could truly say that Colonel Carruthers had served the Society for a long time faithfully and efficiently. They warmly congratulated him on the honour he had received.

Colonel Carruthers expressed his thanks to the Chairman and the members of the Board.

Treatment of Swill.

A letter from the Department of Agriculture for Scotland, dated 10th November, was submitted. The letter stated that the question of arranging for the central collection and sterilisation of swill in Scotland was at present under consideration.

Several members of the Board expressed grave concern with regard to the continued danger of the further spread of foot-and-mouth disease through swill from military camps, public works contractors' camps, lumber camps, and similar places, and the Secretary was instructed to write to the Department inquiring if they had anything further to communicate with regard to arrangements for the collection and sterilisation of swill.

Message of Sympathy to Mr Finlay MacGillivray.

On the motion of Colonel F. J. Carruthers, C.B., it was unanimously agreed that a letter of sympathy be sent to Mr Finlay MacGillivray of Aldie, Tain, on the destruction of his pedigree herd of Shorthorn Cattle and other farm stock on account of an outbreak of foot-and-mouth disease.

Scottish Agricultural Organisation Society.

On the motion of the Earl of Home, K.T., Treasurer, it was unanimously agreed to confirm the proposed grant of £100 to the Scottish Agricultural Organisation Society for the year 1943.

Royal Scottish Agricultural Benevolent Institution.

On the motion of the Earl of Home, K.T., it was also agreed to confirm the proposed grant of £100 to the Royal Scottish Agricultural Benevolent Institution for the year 1943.

Hill Sheep Subsidy.

The Chairman reported on a Conference convened by the National Farmers' Union and Chamber of Agriculture, and various subsequent meetings, at which he had attended as representing the Society. At these meetings were representatives of the various Sheep Breed Societies, and meetings were held with the officials of the Department of Agriculture for Scotland, at one of which meetings the Secretary of State for Scotland was present. Among factors which they had taken into consideration were the fall in prices in 1942 as compared with 1941, the increase in shepherds' wages, and the heavy cost of feeding, &c. Against that they had to put the increased price for mutton and wool, and an increased clip of wool as compared with 1941. They had great difficulty in arriving at the real average prices of hill sheep, as market reports appearing in the Press were affected by the inclusion of special lots, whilst many of them did not include lots of smaller priced lambs selling around 5s. per head.

As the result of all these deliberations, it was finally agreed to ask for a subsidy of 9s. 3d. for 1942, being 1s. 9d. more than the figure, 7s. 6d., paid in 1941. The Treasury, however, had fixed the subsidy at 8s. This figure, he was afraid, would not be sufficient to meet the losses of a great many hill-sheep farmers.

In conclusion, he paid a tribute to the Secretary of State for Scotland and to Sir Patrick Laird and the officials of the Department of Agriculture for the courtesy and help they had extended to the Committee during the whole of the negotiations.

Artificial Insemination.

A Minute of Meeting of the Special Committee, dated 2nd December 1942, was submitted.

The Minute stated that the Committee, after full discussion with representatives of the various Cattle Breed Societies in Scotland, had decided to recommend to the Board of Directors that intimation be made to the Ministry of Agriculture and the

Department of Agriculture for Scotland that the Society objects entirely to the introduction of any scheme of Artificial Insemination for cattle in Scotland, as such a system is neither required nor desired in this country.

Mr J. E. Kerr of Harviestoun, Dollar, Convener of the Special Committee, moved approval of the Minute. He said that all the Cattle Breed Societies, with the exception of the British Friesian, which was in a somewhat different position from the others, were thoroughly in sympathy with the recommendation of the Minute. They entertained the great fear that if artificial insemination became prevalent, cattle would become very much inbred and would deteriorate.

After some discussion, the Minute of the Special Committee was unanimously adopted.

Finance.

A Minute of Meeting of Finance Committee, dated 6th January, was submitted and approved.

The Minute stated that a copy of the Accounts of the Empire Exhibition, Scotland, 1938, had been received, with accompanying letter from the Secretary, from which it appeared probable that a repayment of approximately 6d. per £ would be made on the sum contributed by the Society in respect of its guarantee. The Society guaranteed a sum of £1000, and a provisional call of 4s. in the £ was made, this representing a sum of £200. It appeared, therefore, that of that amount a sum of £25 would probably be refunded.

PROCEEDINGS AT GENERAL MEETINGS.

GENERAL MEETING, 3RD JUNE 1942.

Colonel F. J. CARRUTHERS of Dormont, Hon. Secretary of the Society,
in the Chair.

New Members.

The Secretary submitted a list of eleven candidates for election to membership. These were balloted for and duly elected.

Election of Office-Bearers.

Major R. F. Brebner, Chairman of Directors, moved that the following be elected office-bearers of the Society for the year 1942-43:—

President.—The Duke of Portland, K.G., P.C., G.C.V.O., Langwell, Berriedale, Caithness.

Vice-Presidents.—The Duke of Sutherland, K.T., P.C., Dunrobin Castle, Golspie; The Earl of Leven and Melville, K.T., Glenferness House, Nairn; Sir Donald W. Cameron of Lochiel, K.T., Achnacarry, Spean Bridge, Inverness-shire.

Ordinary Directors, 1939.—Mr George Grant of Glenfardlas, Blacksboat; The Hon. Walter T. H. Scott, Master of Polwarth, Harden, Hawick; Mr Thomas M'Lay, Dumvegan, Causewayhead, Stirling; Mr Peter Gordon, Balcraig Moor, Port William; Mr James Hope, Eastbarns, Dunbar; Captain Ian S. Robertson, Linkwood, Elgin; Mr Alexander Clark, Strathore House, Thornton, Fife; Mr James Kilpatrick, Craigie Mains, Kilmarnock.

1940.—Mr Matthew Templeton, Goshen Bank, Kelso; Mr James R. Lumsden of Arden, Dumbartonshire; Mr J. Faed Sproat, Boreland of Anwoth, Gatehouse, Castle-Douglas; Major R. F. Brebner, The Leuchold, Dalmeny House, Edinburgh; Major A. D. Campbell, Stanstill, Wick; Mr James Paton, Kirkness, Glencairn; Mr Alexander Murdoch, East Hallside, Cambuslang, Lanarkshire; Mr G. H. Russell of The Burn, Glensack, Brechin.

1941.—Mr T. Mercer Sharp, Bardrill, Blackford; Mr James Wyllie, Beaumont, Victoria Road, Dumfries; Mr John Kerr, Yorkston, Gorebridge, Midlothian; Mr Ralph S. MacWilliam, Garguston, Muir of Ord, Ross-shire; Mr A. W. Howison of Lochbank, Blairgowrie; Mr A. A. Hagart Speirs of Elderslie, Houston House, Renfrewshire; Mr John F. Sleight of St John's Wells, Fyvie; Major R. W. Sharpe of The Park, Earlstoun.

1942.—Mr William Hodge, Slodahill, Lockerbie; Mr W. J. Campbell, 61 Fountainhall Road, Edinburgh; Mr Francis W. Walker of Leys, Leys Castle, Inverness; Mr William H. Lawson, Frithfield, Anstruther; Mr William Brown, Craigton, Bishopton; Mr John N. Reid, Cromley Bank, Ellon, Aberdeenshire; Sir Joshua Ross-Taylor, Mungoswalls, Duns; Mr J. E. Kerr of Harviestoun, Dollar.

Extraordinary Directors.—Mr Ian M. Campbell, Bal Blair, Invershin; Mr Alexander Cormack (John Wallace & Sons, Ltd.), Sealladh-Mohr, Killearn; Mr Peter W. Crawford, Dryfeholm, Lockerbie; Mr A. W. Montgomerie, Westburn Farm, Cambuslang, Lanarkshire; Major Sir Samuel Strang Steel of Philiphaugh, Bt., Selkirk; Mr R. Scott Aiton, M.C., Legerwood, Earlstoun; Mr J. W. Alexander, M.V.O., of Newton, Golfhill, Moffat; Mr David Blair, Littleinch, Wormit, Fife; Mr James Durno, Crichtie, Inverurie; Mr T. G. Wilson, Carbeth Home Farm, Balfour Station.

Treasurer.—The Earl of Home, K.T., The Hirsell, Coldstream.

Honorary Secretary.—Colonel F. J. Carruthers of Dormont, Lockerbie.

Major Brebner, in submitting the list, mentioned that, at a Meeting of the Board of Directors held earlier that day, Mr Matthew Templeton was elected a Director for the Border Show Division in room of his brother, the late Mr Thomas Templeton.

Mr James Paton, Kirkness, Glencairn, seconded the motion, and the office-bearers were duly elected.

Special Grants.

In the absence of the Earl of Home, K.T., Treasurer of the Society, Mr James Durno, Crichtie, Inverurie, moved approval of the following Special Grants, which were recommended by the Board of Directors:—

- (1) £200, for the current year, to the Animal Diseases Research Association.
- (2) £100, for the current year, to the Glasgow Veterinary College.
- (3) £50, for the current year, to the Edinburgh Highland Reel and Strathspey Society, plus £25 extra war contribution.

Mr James R. Lumsden of Arden seconded the motion, and the Special Grants were duly approved.

Scottish Red Cross Agriculture Fund.

Major R. F. Brebner submitted the following Report on the activities of the Committee during its second year of operations, from 17th April 1941 to 16th April 1942. He said: "The Second Annual Report has now been issued, and will appear in the forthcoming volume of the Society's 'Transactions.'"

"The total amount of contributions received was £109,717. To this sum was added a sum of £122, 6s. 10d., being interest accruing on sums placed on Deposit Receipt for short periods. That gave a total for the year of £109,839, 6s. 10d.

"Adding that amount to the sum of £115,876, 14s. 2d., raised during the first year, gave a grand total of £225,716, 1s. raised by the Committee during its two years of activity.

"As in the first year, the whole of the money raised was handed over to the Scottish Branch, British Red Cross Society, and the St Andrew's Ambulance Association. The total allocation to the former body during the past two years was £191,316, 15s. 5d., and to the latter, £34,399, 5s. 7d.—in all £225,716, 1s.

"The expenses, which amounted to a sum of £128, 4s. 9d., were again defrayed by the Highland and Agricultural Society, which also provided the staff, office accommodation, telephone service, &c., free of charge.

"At a Meeting of the General Committee of the Fund, held on 20th May, cordial resolutions of thanks were passed to all those bodies and individuals who had contributed so generously to the remarkable success of the Fund. A cordial vote of thanks was accorded to the Directors and members of the Highland and Agricultural Society, and also to the Society's Secretary and staff, for the valuable work which the Society had performed in furtherance of the movement.

"In a letter, dated 1st May, Brigadier T. C. Mudie, Secretary of the Scottish Branch, British Red Cross Society, said: 'I am asked to request you to convey to the Highland and Agricultural Society our thanks for again meeting all expenses incurred by the Committee, and for providing the staff and accommodation for the Committee.'

"During the coming year it is hoped that Free Gift Sales, which have provided such a splendid contribution to the Fund during the past, may be continued, and, if possible, extended to new areas. The scheme for encouraging the holding of Shows of Garden Produce by Horticultural Societies and Allotment Associations will be continued, and it is believed many more of these will be held than in the previous year. The scheme of contributions by farm workers will be continued, and it is hoped will greatly develop in the course of the year.

"The Committee's third year of operations has already made a promising beginning. Since the close of the second year a sum of £2008, 15s. 3d. has been received. This is made up of varying amounts, the most outstanding of which are a sum of £1034, 6s., being the proceeds of a Free Gift Sale held at Wishaw in February, and a donation of £500 from Scottish Agricultural Industries, Ltd., and its Branches and subsidiary Companies in the Scottish Area."

Colonel F. J. Carruthers of Dormont said that it was a very gratifying Report. He expressed appreciation of the very hard work carried out by the Secretary and his staff, and also of the work done by Major Brebner as one of the Vice-Chairmen of the Fund.

The Report was approved.

Hill Sheep Farming Inquiry.

Mr William I. Elliot, Middleton, Stow, submitted the following Report:—

"In December 1941 a letter was received from the Secretary of the Committee, under Lord Balfour of Burleigh's Chairmanship, which had been constituted by the Secretary of State for Scotland to investigate the position of Hill and Upland Sheep Farming in Scotland. The letter stated that the Committee desired to obtain evidence and views from bodies interested, and invited the Society to nominate representatives to submit evidence.

"The Directors decided that evidence should be submitted by the Society, and nominated the following representatives:—

Borders—Mr William I. Elliot, Middletoun, Stow.

Perthshire—Mr A. W. Howison of Lochbank, Blairgowrie.

Northern Counties—Major Gideon C. Rutherford, Proney, Dornoch.

Argyll—Mr J. A. Fletcher, Laudale, Ardgour.

"A Statement of Evidence was prepared, and, in due course, forwarded to the Committee.

"The representatives, accompanied by the Chairman of Directors, Major R. F. Brehner, appeared before the Committee at St Andrew's House on Wednesday, 29th April, when they submitted their evidence on behalf of the Society."

Continuing, Mr Elliot said he was speaking in the presence of two members of Lord Balfour's Committee, and he would like to add that that Committee had given the Society's representatives a long and courteous and attentive hearing, and had asked them some very pointed and useful questions. It was hoped that great good would come out of these efforts.

Agricultural Education.

Sir Joshua Ross-Taylor said that Colonel Carruthers of Dormont, Convener of the Education Committee, had asked him to submit the following Report on the 44th Examination for the National Diploma in Agriculture:—

"At the Examination held at Leeds from 8th to 14th April 1942, 99 candidates presented themselves, as compared with 86 at the Examination held in 1941. Seventeen candidates were from Scottish centres. As a result of the Examination, 32 Diplomas were awarded—1 with Honours. Of the 99 candidates, 3 appeared for all subjects, and of these, 2 obtained the Diploma. Thirty-five had passed certain subjects previously, and were completing the Examination this year, and of these, 30 were successful in obtaining the Diploma. The names of the successful candidates will appear in the next volume of 'Transactions.'

"The remaining 61 presented themselves for first groups of three, four, or five subjects, and of these, 32 passed in the subjects for which they appeared, and are entitled to appear for the second group of subjects at a subsequent Examination."

Sir Joshua added that it was most satisfactory that in these difficult times candidates continued to come forward for these Examinations, and further, in the view of the Examiners, that the standard was being maintained, if not improved upon, in recent years.

Farm Valuations under the Finance Act, 1942.

Major Brehner, Chairman of Directors, said he thought he should bring to the notice of members two matters considered by the Board of Directors earlier that day. The first was in connection with the Finance Act of 1942. As they probably all knew, the Chancellor of the Exchequer, in his Budget speech, had said he was instructing the Inland Revenue authorities to consult the farming community with regard to the vexed question of the valuation of stock. It had been noted that the Department had arranged with the Inland Revenue authorities to meet the National Farmers' Union, and the Directors felt that the Highland and Agricultural Society, representing as it did the interests not only of farmers, owner-occupiers, but also proprietors, should be consulted about the matter, and so they had reappointed the Committee which had previously considered the question of Income Tax, for the purpose of preparing evidence to be submitted to the authorities.

Scottish Land Settlement Committee.

The other matter considered, he said, was the question of Land Settlement. As they knew, the Secretary of State for Scotland had appointed a Committee (under the Chairmanship of Sir John Watson) to consider the question of land settlement, and what procedure might be adopted for improving land settlement all over the country. The Directors had been invited by Sir John Watson's Committee to submit their views on this question, and, as the Highland and Agricultural Society probably dealt with land settlement before anyone else had thought about it, the Directors considered that it was only right and proper that the Society should submit evidence, and the Directors had appointed, accordingly, a Committee for that purpose.

Science.

Report by Chemist.—Dr J. F. Tocher, Consulting Chemist to the Society, submitted a Report on the work done in the Chemical Department during the five months ending 31st May. The substance of the Report appears on pp. 117-121 of this volume.

Report on Bracken Investigation.—Dr Tocher also gave a short account of his investigations. He said that, with regard to mature bracken, he had used solvents, such as ether and alcohol, in order to extract substances which are likely to be injurious or dangerous to animal life. Contrary to expectation, the dried extract had no visible effect on young animals. Solvents are now being used, other than ether and alcohol, in order to see whether any poisonous substances extracted by these solvents would be injurious to live stock. The results of feeding experiments had been entirely negative—no injurious effect had been produced by feeding animals with bracken extract.

Two experiments were conducted on cattle with equal parts of young bracken and grass. The animals selected were well-fed animals, and it was evident, on account of that fact, that they ate the mixed bracken silage very reluctantly. Experiments are now being conducted on young stirks whose rations consist entirely of turnips and straw.

He proposed, he said, during the summer to carry out further experiments with both young and mature bracken.

Vote of Thanks.

On the motion of Mr Alexander Murdoch, East Hallside, Cambuslang, a vote of thanks was accorded to Colonel Carruthers for presiding. Colonel Carruthers, he said, always made a most excellent Chairman. He was always alert, and was one of the most active members on the Board of Directors.

ANNIVERSARY GENERAL MEETING, 6TH JANUARY 1943.

THE EARL OF HOME, K.T., Treasurer of the Society, in the Chair.

Election of Members.

The Secretary submitted a list of twenty candidates for election to membership. These were balloted for and duly elected.

Membership.

Major R. F. Brebner, Chairman of Directors, reported that the membership of the Society at the beginning of 1942 was 8997. During the year there were lost, through death, resignation, and other causes, 460 members. New members elected during the year numbered 16 (5 in January and 11 in June), thus making the total membership at that date 8553.

Of this number 5636 were Life Members and 2917 annual subscribers—297 on the higher and 2620 on the lower rate. 80 members of the Society had intimated that they were on service with H.M. Forces, and these, in accordance with a resolution of the Directors, would continue to receive the privileges of membership, without payment of subscriptions, throughout the duration of the war.

Finance.

Mr Alexander Murdoch, East Hallside, Cambuslang, on behalf of the Treasurer, the Earl of Home, K.T., submitted the Accounts of the Society for the year ending 30th November 1942.

In order to economise in paper and save expense, he said, the Abstract of Accounts had not been issued to each member, as was customary in pre-war years. A short Abstract, however, had been published in various newspapers, as laid down in the bye-laws.

As regards the Capital Funds, the Society's investments had further appreciated in value during the year, owing to increasing market prices.

Revenue for the year from all sources amounted to £8896, 7s. 6d., of which £1549, 15s. had been derived from annual subscriptions and £1113 from life subscriptions.

Expenditure amounted to £7557, 4s. 6d. During the year under review the expenditure on Educational work amounted to £186, 7s. 6d.; on work in the Chemical and Veterinary Departments, £316, 8s. 2d.; on the Society's 'Transactions,' £1250, 7s. 10d.; and in grants to Local Societies in 1941, £459, 14s. 3d.

Special Grants had been made during the year as follows: Animal Diseases Research Association, £200; Glasgow Veterinary College, £100; Scottish Agricultural Organisation Society, £100; Scottish Red Cross Agriculture Fund, £128, 4s. 9d.; other Grants, £97, 2s.—a total of £625, 6s. 9d.

It would be noted from the view of receipts and payments that, excluding the income from life subscriptions, which should be regarded as a capital receipt, the Accounts showed a surplus of £226 for the year.

Mr Murdoch thereafter moved approval of the following Special Grants, which had been recommended by the Board of Directors:—

- (1) £100 to the Scottish Agricultural Organisation Society for the year 1943.
- (2) £100 to the Royal Scottish Agricultural Benevolent Institution.
- (3) £10 to the Scottish Society for the Prevention of Cruelty to Animals.

Mr George Grant, Glenfarclas, Blackboat, seconded, and the Accounts were then adopted and the Special Grants unanimously approved.

Argyll Naval Fund.

Mr James R. Lumsden of Arden, Convener of the Committee of the Argyll Naval Fund, submitted the report on the Fund for the year ended 30th November 1942. The income from the Fund for the year amounted to £338, 9s. 3d., while the expenditure comprised grants of £40 each to seven naval cadets—a total of £280.

Scottish Red Cross Agriculture Fund.

The Earl of Home, K.T., reported that during the period from 17th April 1942, the beginning of the third year of activities, up to the previous day (the 5th January), a sum of £49,637, 18s. had been received by the Committee. Adding that to the amount raised during the first and second financial years, £225,716, 1s., gave a grand total of £275,358, 19s. contributed by Scottish Agriculture to the benevolent work of the Red Cross during a period of two years and eight months.

That morning there had been received, he said, further sums amounting to £567, 5s., now making the total since 17th April 1942, £50,205, 3s., and a grand total of £275,921, 4s.—a wonderful achievement for the agricultural community.

Free Gift Sales.—In the past eight months the number of Free Gift Sales held had been much less than the numbers held during the corresponding period in the preceding two years. That was due to the fact that restrictions on the use of petrol gave rise to fears that such sales could not be carried through with success. These restrictions, it was anticipated, would interfere not only with the transport of live stock and goods to and from the sales, but also with the attendance of potential buyers. For that reason many Area Committees had decided to adopt a system of voluntary levy or collection.

It was a notable fact, however, that Free Gift Sales which had been held had, in practically every case, shown an increase in the proceeds as compared with the corresponding sales in previous years. Of the sums which had come to hand, outstanding amounts were from the following centres: Castle Douglas, £13,000; Tain, £4887; Duns, £4288; Aberfeldy and district, £2597; and Paisley, £2000, the latter being a contribution from the proceeds of a sale organised by the Renfrewshire Agricultural Society and the County Branches of the N.F.U. and Chamber of Agriculture of Scotland.

Voluntary Levies and Collections.—As already mentioned, many Area Committees, he said, had adopted the method of voluntary levy in order to raise money for the Fund. The usual contribution which farmers had been invited to make was at the rate of 1s. on the £ of rental. Only a few of these had yet come to hand, but mention might be made of Kelso and district, which had raised £3043; Lockerbie area, £2378; Laurencekirk area, £2000; Inverness farmers, £1137; and St Boswells area (first instalment), £1000.

Victory Garden Shows and Sales.—The scheme for encouraging the holding of Victory Garden Shows and Sales had met with increasing support in 1942. Between sixty and seventy Societies organised Shows or Sales of garden produce on behalf of the Fund. The total realised to date from these shows and sales was nearing the sum of £4000, which was double the amount received from the same source in the preceding year.

Farm Workers' Contributions.—The Scheme for Penny-a-Week contributions from farm workers had made progress during the past year, and a sum of £321 had so far been received from that source. That was double the amount reported at this time a year ago. The County of East Lothian, with a sum of £143, 13s. 7d., continued to hold the lead in respect of these contributions.

Miscellaneous.—Contributions from other sources amounted to a sum of £4095, 1s. 6d. Details will be published in due course, but mention might be made of a contribution of £1963 from the National Association of Corn and Agricultural Merchants (Scottish Council), and £500 from Scottish Agricultural Industries, Ltd., and its branches and subsidiary companies.

Continuing, Lord Home said that the members of the Committee of the Fund were most grateful for the great support the agricultural community had given.

Lord Home added that he wished to refer to the sad passing of a great friend of the Fund—Mr David Hutcheson of St Boswells. He was a great help to the Fund, especially in connection with the Free Gift Sales. All regretted his death, and sympathised very deeply with his widow and family.

Grants to Local Societies.

Mr James Paton, Kirkness, Glencraig, Vice-Convener of the Shows Committee, in submitting the Report on Grants to Local Societies, said that two years ago the Directors decided that all grants by the Society of money or medals in aid of Local Agricultural Shows be suspended for the duration of the war. In consequence, the grants made by the Society for 1942 had been largely confined to Horse-breeding Associations in Scotland, and a total sum of £225 had been expended during the year in respect of such grants. Special grants to Federations of Scottish Women's Rural Institutes and for Allotments Competitions amounted to £63, 6s. 9d., and the cost of Ploughing, Hoesing, and Long Service Awards was £69, 14s. 9d.—making a total expenditure of £358, 1s. 6d. for the year 1942.

The issue of Gold Medals for Long Service had also been temporarily suspended during the war, but applicants would be entitled, in the meantime, to the appropriate Certificate, and could apply for the Gold Medals when these become available.

For the year 1943 the Directors had authorised the following grants: nine Horse-breeding Associations for grants of £15 each in respect of Stallions engaged; £15 and fifteen Silver Medals to the Scottish National Union of Allotment Holders for Allotments Competitions; various special grants to Federations of Scottish Women's Rural Institutes; and the usual awards for Long Service, &c.—the total estimated expenditure in 1943 for all grants being £330, 2s. 3d.

Agricultural Education.

National Diploma in Dairying.—Colonel F. J. Carruthers, C.B., of Dormont, Convener of the Education Committee, reported on the Forty-seventh Annual Examination for the National Diploma in Dairying which took place during September 1942 at the Dairy School for Scotland, Auchincruive, Ayr, for Scottish students, and at the University and British Dairy Institute, Reading, for English and Welsh students.

At the Auchincruive centre 38 candidates presented themselves—an increase of 8 over the previous Examination. 33 candidates appeared for all subjects, 4 for re-examination in certain subjects in which they had previously failed, and 1 entered for Part I. of the Examination. 17 candidates were successful in obtaining the Diploma.

At the Reading centre 45 candidates presented themselves—32 candidates for all subjects, 11 for re-examination in certain subjects, and 2 for Part I. of the Examination. 26 candidates obtained the Diploma.

The names of successful candidates would be published in the next volume of the 'Transactions.'

Of those candidates who failed, 11 at Auchincruive and 10 at Reading failed in not more than three subjects, and these would be permitted to reappear for the subjects in which they failed at the next Examination.

General.

Major R. F. Brebner, Chairman of Directors, reported shortly on various matters which, during the past six months, had engaged the attention of the Board of Directors.

Scottish Land Settlement.—A Statement of Evidence had been prepared and submitted to the Scottish Land Settlement Committee, and members of the Board had appeared before the Committee in support of the written evidence.

Farm Valuations.—In this connection he said that a Special Committee of the Board had collaborated with the N.F.U. and Chamber of Agriculture of Scotland in making representations to the Inland Revenue authorities regarding Farm Valuations under the 1942 Finance Act.

Treatment of Swill.—In support of representations made by the Scottish Shorthorn Breeders' Association to the Ministry of Agriculture, a letter had been addressed to the Secretary of State for Scotland urging the necessity of something being done to remove the serious dangers which then existed owing to laxity in the correct treatment of swill before being fed to animals. It was pointed out that if it were found impracticable to provide central boiling depots, then some other means should be devised to ensure proper treatment before the swill reached the farmer or pig-feeder.

Artificial Insemination.—In November last the Directors had appointed a Special

Committee to consider the attitude the Society should adopt with regard to the promotion of Artificial Insemination in Scotland. Major Brebner went on to say that, after consultation with representatives of Cattle Breed Societies in Scotland, that Committee had earlier that day submitted a Report, in which it recommended that intimation be made to the Ministry of Agriculture and the Department of Agriculture for Scotland that the Society objects entirely to the introduction of any scheme of Artificial Insemination for cattle in Scotland, as such a system is neither required nor desired in this country.

Control of Animal Diseases.—Major Brebner said that he had represented the Society at a Conference convened by the N.F.U. and Chamber of Agriculture of Scotland, when agreement was reached in regard to the introduction of a scheme for control of the four main animal diseases—mastitis, sterility, contagious abortion, and John's disease.

Hill Sheep Subsidy.—Major Brebner stated that he had also attended a Conference convened by the N.F.U. and Chamber of Agriculture of Scotland regarding the question of the payment of a Hill Sheep subsidy for 1942, and had collaborated with that body, and other bodies interested, in representations on the subject made to the Secretary of State for Scotland and the Department of Agriculture.

Future of Agriculture.—Major Brebner concluded by saying that the Society's Agricultural Policy Committee continued to give consideration to the question of post-war agricultural conditions in Scotland, but had not yet formulated any definite findings.

Science.

Report by Chemist.—Dr J. F. Tocher, Consulting Chemist to the Society, submitted a brief summary of the results of analyses made by him and comments on the results for 1942. The substance of the Report appears on pp. 117-121 of this volume.

Bracken.—Dr Tocher stated that he had not yet been able to obtain any substance in mature bracken which would be injurious to or cause the death of animals. Mature bracken had been fed by itself, and extracts of bracken using various solvents had also been fed, to test the effect of bracken on animal life. Contrary to expectation, the dried extract had no visible effect on young animals. Results of feeding experiments on small animals had been entirely negative in character. He stated that he had arranged for a series of experiments to be conducted using young bracken in the spring. He hoped to arrange to feed mixed bracken silage to young bullocks. In the meantime he could not say that he had found any poisonous substance in bracken which would cause illness or death of live stock. His investigation, however, was far from complete. It was quite clear that bracken is not an attractive feeding-stuff to live stock, but he could not say, without further experiments, whether it could be utilised as part of a ration. As he had shown in his recent article in the 'Transactions,' it is being used in foreign countries. Bracken had got a very bad name among owners of live stock. It was a disappointment to him not to be able to find in mature bracken a poisonous substance injurious to live stock, but he was not going to say there is no such substance.

Vote of Thanks.

On the motion of Mr Peter Gordon, BalCraig Moor, Port William, a vote of thanks was accorded to the Earl of Home for presiding.

APPENDIX

PREMIUM BOOK

OF

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND 1943

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Address for communications:

JOHN STIRTON, Secretary,

The Highland and Agricultural Society of Scotland,

8 Eglinton Crescent,

Edinburgh 12.

GENERAL NOTICE.

THE HIGHLAND SOCIETY was instituted in the year 1784, and incorporated by Royal Charter in 1787. Its operation was at first limited to matters connected with the improvement of the Highlands of Scotland; but the supervision of certain departments, proper to that part of the country, having been subsequently committed to special Boards of Management, several of the earlier objects contemplated by the Society were abandoned, while the progress of agriculture led to the adoption of others of a more general character. The exertions of the Society were thus early extended to the whole of Scotland, and have since been continuously directed to the promotion of the science and practice of agriculture in all its branches.

In accordance with this more enlarged sphere of action, the original title of the Society was altered, under a Royal Charter, in 1834, to THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

The Society avoids questions of political controversy, but in other public matters of practical concern to agriculture it seeks to guard and promote, by every means in its power, the welfare of all interested in the agriculture of Scotland.

Among the more important measures which have been effected by the Society are—

1. Agricultural Meetings and General Shows of Stock, Implements, &c., held in the principal towns of Scotland, at which exhibitors from all parts of Great Britain, Northern Ireland, and Eire (Irish Free State) are allowed to compete.

2. A system of District Shows instituted for the purpose of improving the breeds of Stock most suitable for different parts of the country, and of aiding and directing the efforts of Local Agricultural Societies and Associations.

3. A scheme of Awards to Farm Workers for long and approved service in Scotland.

4. The encouragement of Agricultural Education, under powers conferred by a supplementary Royal Charter, granted in 1856, and authorising the Society to grant Diplomas to Students of Agriculture; and by giving grants in aid of education in Agriculture and allied sciences. In 1900 the Society discontinued its own Examination, and instituted jointly with the Royal Agricultural Society of England an Examination for a National Diploma in Agriculture.

5. The institution of an Examination for a National Diploma in Dairying, jointly with the Royal Agricultural Society of England and the British Dairy Farmers' Association.

6. The institution of an Examination in Forestry for First and Second Class Certificates. Terminated in 1935 in accordance with arrangements made with the Royal Scottish Forestry Society.

7. The advancement of the Veterinary Art, by conferring Certificates on Students who have passed through a prescribed curriculum, and who are found, by public examination, qualified to practise. Terminated in 1881 in accordance with arrangements made with the Royal College of Veterinary Surgeons.

8. The appointment of a Chemist for the purpose of promoting the application of science to agriculture.

9. The establishment of a Botanical Department.

10. The appointment of an Entomologist to advise members regarding insect pests, &c.

11. The annual publication of the 'Transactions,' comprehending papers by selected writers, Prize Reports, and reports of experiments, also an abstract of the business at Board and General Meetings, and other communications.

12. The management of a fund left by John, 5th Duke of Argyll (the original President of the Society), to assist young natives of the Highlands who enter His Majesty's Navy.

CONSTITUTION AND MANAGEMENT.

The general business of THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND is conducted under the sanction and control of the Royal Charters, referred to above, which authorise the enactment of Bye-Laws.

The Office-Bearers consist of a President, Four Vice-Presidents, Thirty-two Ordinary and Twenty Extraordinary Directors, a Treasurer, an Honorary and an Acting Secretary, an Auditor, and other Officers.

The Supplementary Charter of 1856 provides for the appointment of a Council on Education, consisting of Sixteen Members—Nine nominated by the Charter and Seven elected by the Society.

STATEMENT OF PRIVILEGES OF MEMBERS.

MEMBERS OF THE SOCIETY ARE ENTITLED—

1. *To receive a free copy of the 'Transactions' annually.*
2. *To apply for District Premiums that may be offered, and for Long Service Awards for Agricultural Employees.*
3. *To report Ploughing Matches for Medals that may be offered.*
4. *To Free Admission to the Shows of the Society.*
5. *To exhibit Live Stock and Implements at reduced rates.*

Firms are not admitted as Members; but if one partner of a firm becomes a Member the firm is allowed to exhibit at Members' rates.

6. *To have Fertilisers and Feeding-Stuffs, &c., analysed at reduced fees.*
7. *To obtain Reports on the Animal Enemies of Crop Plants and Live Stock (including Poultry).*
8. *To attend and vote at General Meetings of the Society.*
9. *To vote for the Election of Directors.*
&c., &c.

ANALYSES OF FERTILISERS AND FEEDING-STUFFS, &c.

The scale of Fees in respect of Analyses made by the Society's Chemist for Members of the Society will be found under "Chemical Department."

Valuations of manures, according to the Society's scale of units, will be supplied on application being made.

For further particulars, see under Chemical Department.

Chemist.—Mr J. F. TOCHER, D.Sc., LL.D., F.I.C., Crown Mansions, 41½ Union Street, Aberdeen.

REPORTS ON THE ANIMAL ENEMIES OF CROP PLANTS AND LIVE STOCK (INCLUDING POULTRY).

The Consulting Zoologist is prepared to send to any Member of the Society a Report on damage to, or diseases of, plants and animals due to animal agency (Insects, Mites, Worms, Snails, Slugs, Birds, and the Smaller Mammals).

For further particulars, see under Entomological Department.

Consulting Zoologist.—Mr A. E. CAMERON, M.A., D.Sc., Department of Agricultural and Forest Zoology, University of Edinburgh, 10 George Square, Edinburgh.

TERMS OF MEMBERSHIP, &c.

The influence and usefulness of the Society depend mainly upon its strength in membership. The Members, through the Directors whom they elect, have the practical control of the affairs of the Society. The stronger the body of Members, the greater will be the usefulness of the Society. It will therefore be to both their own and the public advantage if all who are interested in agriculture, and who are not already enrolled, should at once become Members of the Society.

ELECTION OF MEMBERS.

Candidates for admission to the Society must be proposed by a Member, and are elected at the half-yearly General Meetings in January and June. It is not necessary that the proposer should attend the Meeting.

RATES OF SUBSCRIPTION.

HIGHER SUBSCRIPTION.

The ordinary annual subscription is £1, 3s. 6d., and the ordinary subscription for life-membership is £12, 12s.; or after ten annual payments have been made, £7, 7s.

LOWER SUBSCRIPTION.

Proprietors farming the whole of their own lands, whose rental on the Valuation Roll does not exceed £500 per annum, and all Tenant-Farmers, Secretaries or Treasurers of Local Agricultural Associations, Factors resident on Estates, Land Stewards, Foresters, Agricultural Implement Makers, Grain, Seed and Manure Merchants, Agricultural Auctioneers, Cattle Dealers and Veterinary Surgeons, none of them being also owners of land to an extent exceeding £500 per annum, and such other persons as, in respect of their official or other connection with agriculture, the Board of Directors may consider eligible, are admitted on a subscription of 10s. annually, which may be redeemed by one payment of £7, 7s., and after eight annual payments of 10s. have been made, a Life Subscription may be purchased for £5, 5s., and after twelve such payments, for £3, 3s.

It must be stated, on behalf of Candidates claiming to be admitted at the Lower Rate of Subscription (10s.), under which of the above designations they are entitled to be admitted at the Lower Rate.

Subscriptions are payable on election, and afterwards annually in January.

According to the Charter, a Member who shall not have objected to his election, on the same being intimated to him by the Secretary, cannot retire until he has paid, in annual subscriptions or otherwise, an amount equivalent to a life composition.

Members are requested to send to the Secretary the names and addresses of Candidates proposed for admission to the Society, at the same time stating whether the Candidates should be admitted at the £1, 3s. 6d. or 10s. rate.

Patron of the Society.—HIS MAJESTY THE KING.

OFFICERS AND DIRECTORS FOR 1942-1943.

President.

Sir DONALD W. CAMERON OF LOCHIEL, K.T., Achnacarry, Spean Bridge, Inverness-shire.

Vice-Presidents.

THE DUKE OF SUTHERLAND, K.T., P.C., Dunrobin Castle, Golspie.
THE EARL OF LEVEN AND MELVILLE, K.T., Glenferness House, Nairn.

Ordinary Directors.

Year of
Election.

	GEORGE GRANT of Glenfarclas, Blacksboat.
1939	THOMAS M'LAY, Dunvegan, Causewayhead, Stirling. PETER GORDON, Balcraig Moor, Port William. JAMES HOPE, Eastbarns, Dunbar. Captain IAN S. ROBERTSON, Linkwood, Elgin. ALEXANDER CLARK, Strathore House, Thornton, Fife. JAMES KILPATRICK, Craigie Mains, Kilmarnock. MATTHEW TEMPLETON, Goshen Bank, Kelso (<i>elected 3rd June 1942</i>). JAMES R. LUMSDEN of Arden, Dumbartonshire. J. FAED SPROAT, Boreland of Anwoth, Gatehouse, Castle Douglas.
1940	Major R. F. BREBNER, The Leuchold, Dalmeny House, Edinburgh. Major A. D. CAMPBELL, Stanstill, Wick. JAMES PATON, Kirkness, Glencraig. ALEXANDER MURDOCH, East Hallside, Cambuslang, Lanarkshire. G. H. RUSSELL of The Burn, Glenesk, Brechin. T. MERCER SHARP, Bardrill, Blackford. JAMES WYLLIE, Beaumont, Victoria Road, Dumfries. JOHN KERR, Yorkston, Gorebridge, Midlothian. RALPH S. MACWILLIAM, Garguston, Muir of Ord, Ross-shire (<i>elected 3rd June 1942</i>).
1941	A. W. HOWISON, Rannagulzion, Blairgowrie. A. A. HAGART SPEIRS of Elderslie, Houston House, Renfrewshire. JOHN P. SLEIGH of St John's Wells, Fyvie. Major ROBERT W. SHARPE, C.B.E., of The Park, Earlston.
1942	W. J. CAMPBELL, 61 Fountainhall Road, Edinburgh. FRANCIS W. WALKER of Leys, Leys Castle, Inverness. WILLIAM H. LAWSON, Frithfield, Anstruther. WILLIAM BROWN, Craigton, Bishopton, Renfrewshire. JOHN N. REID, Cromley Bank, Ellon. Sir JOSHUA ROSS-TAYLOR, Mungoswalls, Duns. J. E. KERR of Harviestoun, Dollar.

Year of
Election.

Extraordinary Directors.

1941	IAN M. CAMPBELL, Bal Blair, Invershin.
	ALEXANDER CORMACK (John Wallace & Sons, Ltd.), Sealladh-Mohr, Killearn.
	PETER W. CRAWFORD, Dryfeholm, Lockerbie.
	A. W. MONTGOMERIE, Westburn Farm, Cambuslang, Lanarkshire.
1942	Major Sir SAMUEL STRANG STEEL of Philiphaugh, Bt., Selkirk.
	R. SCOTT AITON, M.C., Legerwood, Earlston.
	J. W. ALEXANDER, M.V.O., of Newton, Golfhill, Moffat.
	DAVID BLAIR, Littleinch, Wormit, Fife.
	JAMES DURN, Crichtie, Inverurie.
	T. G. WILSON, Carbeth Home Farm, Balfron Station.

Chief Officials, &c.

THE EARL OF HOME, K.T., The Hirsell, Coldstream, *Treasurer*.

Colonel F. J. CARRUTHERS, C.B., of Dormont, Lockerbie, *Honorary Secretary*.

JOHN STIRTON, 8 Eglinton Crescent, Edinburgh, *Secretary*.

THOMAS W. RUSSELL, *Chief Clerk*.

JOHN WATT, *Second Clerk*.

GEORGE JAMES GREGOR, C.A., 8 York Place, Edinburgh, *Auditor*.

J. F. TOCHER, D.Sc., LL.D., F.I.C., 41½ Union Street, Aberdeen, *Chemist*.

HENRY RAESIDE, 8 Eglinton Crescent, Edinburgh, *Master of Works*.

A. E. CAMERON, M.A., D.Sc., University of Edinburgh, 10 George Square, Edinburgh, *Consulting Zoologist*.

The Very Rev. CHARLES L. WARR, D.D., 63 Northumberland Street, Edinburgh, *Chaplain*.

TODS, MURRAY, & JAMIESON, W.S., 66 Queen Street, Edinburgh, *Law Agents*.

WILLIAM BLACKWOOD & SONS LTD., 45 George Street, Edinburgh, *Publishers*.

HAMILTON & INCHES, Princes Street, Edinburgh, *Silversmiths*.

ALEXANDER KIRKWOOD & SON, 9 St James' Square, Edinburgh, *Medallists*.

JOHN MENZIES & CO. LTD., 6 Castle Street, Edinburgh, *Advertising Agents*.

FRANK REID, 55 Blenheim Place, Aberdeen, *Showyard Erector*.

J. P. LAUDER, *Officer and Caretaker*.

Chairman of Board of Directors.

Major R. F. BREBNER, The Leuchold, Dalmeny House, Edinburgh.

Chairmen of Committees.

1. Argyll Naval Fund	JAMES R. LUMSDEN of Arden, Dumbartonshire.
2. Finance, Chambers, and Law	The EARL OF HOME, K.T., The Hirsell, Coldstream.
3. Publications	Colonel F. J. CARRUTHERS, C.B., of Dormont, Lockerbie.
4. Shows	IAN M. CAMPBELL, Bal Blair, Invershin.
5. Implements and Machinery	Sir JOSHUA ROSS-TAYLOR, Mungoswalls, Duns.
6. Science	Major ROBERT W. SHARPE, C.B.E., of The Park, Earlston.
7. General Purposes	Major R. F. BREBNER, The Leuchold, Dalmeny House, Edinburgh.
8. Education	Colonel F. J. CARRUTHERS, C.B., of Dormont, Lockerbie.
9. Office-Bearers	Major R. F. BREBNER, The Leuchold, Dalmeny House, Edinburgh.

COMMITTEES FOR 1942-1943.

1. ARGYLL NAVAL FUND.

JAMES R. LUMSDEN of Arden, Dumbartonshire, *Convener*.
 Major A. D. CAMPBELL, Stanstill, Wick.
 Sir GEORGE I. CAMPBELL of Succoth, Bt., Crarae Lodge, Minard, Argyll.
 IAN M. CAMPBELL, Bal Blair, Invershin.
 Lieut.-Colonel GARDEN B. DUFF, D.S.O., of Hatton, Hatton Castle, Turiff.
 The EARL OF ELGIN AND KINCARDINE, K.T., C.M.G., Broomhall, Dunfermline.
 J. E. KERR of Harviestoun, Dollar.
 ALEXANDER MURDOCH, East Hallside, Cambuslang, Lanarkshire.
 Sir JOSHUA ROSS-TAYLOR, Mungoswalls, Duns.
 Major R. F. BREBNER, The Leuchold, Dalmeny House, Edinburgh, Chairman of Board of Directors, *ex officio*.
 The EARL OF HOME, K.T., The Hirsell, Coldstream, Treasurer, *ex officio*.
 Colonel F. J. CARRUTHERS, C.B., of Dormont, Lockerbie, Honorary Secretary, *ex officio*.

2. FINANCE, CHAMBERS, AND LAW.

The EARL OF HOME, K.T., The Hirsell, Coldstream, Treasurer, *Convener*.
 Major R. F. BREBNER, The Leuchold, Dalmeny House, Edinburgh.
 IAN M. CAMPBELL, Bal Blair, Invershin.
 JAMES DURNO, Crichtie, Inverurie.
 GEORGE GRANT of Glenfarclas, Blacksboat.
 J. E. KERR of Harviestoun, Dollar.
 JAMES R. LUMSDEN of Arden, Dumbartonshire.
 ALEXANDER MURDOCH, East Hallside, Cambuslang, Lanarkshire.
 JAMES PATON, Kirkness, Glencraig.
 Sir JOSHUA ROSS-TAYLOR, Mungoswalls, Duns.
 Major ROBERT W. SHARPE, C.B.E., of The Park, Earlstoun.
 T. G. WILSON, Carbeth Home Farm, Balfron Station.
 Colonel F. J. CARRUTHERS, C.B., of Dormont, Lockerbie, Honorary Secretary, *ex officio*.
 GEORGE JAMES GREGOR, C.A., Auditor, *ex officio*.

3. PUBLICATIONS.

Colonel F. J. CARRUTHERS, C.B., of Dormont, Lockerbie, Honorary Secretary, *Convener*.
 J. W. ALEXANDER, M.V.O., of Newton, Golfhill, Moffat.
 Major R. F. BREBNER, The Leuchold, Dalmeny House, Edinburgh.
 IAN M. CAMPBELL, Bal Blair, Invershin.
 JAMES DURNO, Crichtie, Inverurie.
 GEORGE GRANT of Glenfarclas, Blacksboat.

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 Captain IAN S. ROBERTSON, Linkwood, Elgin.
 Sir JOSHUA ROSS-TAYLOR, Mungoswalls, Duns.
 G. H. RUSSELL of The Burn, Glenesk, Brechin.
 Major ROBERT W. SHARPE, C.B.E., of The Park, Earlstoun.
 T. G. WILSON, Carbeth Home Farm, Balfron Station.
 The EARL OF HOME, K.T., The Hirsell, Coldstream, Treasurer, *ex officio*.

4. SHOWS.

IAN M. CAMPBELL, Bal Blair, Invershin, *Convener*.
 JAMES PATON, Kirkness, Glencairg, *Vice-Convener*.
 R. SCOTT AITON, M.C., Legerwood, Earlstoun.
 J. W. ALEXANDER, M.V.O., of Newton, Golfhill, Moffat.
 DAVID BLAIR, Littleinch, Wormit, Fife.
 Major R. F. BRENNER, The Leuchold, Dalmeny House, Edinburgh.
 WILLIAM BROWN, Craigton, Bishopton, Renfrewshire.
 Major A. D. CAMPBELL, Stanstill, Wick.
 W. J. CAMPBELL, 61 Fountainhall Road, Edinburgh.
 ALEXANDER CLARK, Strathore House, Thornton, Fife.
 ALEXANDER CORMACK (John Wallace & Sons, Ltd.), Sealladh-Mohr, Killearn.
 PETER W. CRAWFORD, Dryfeholm, Lockerbie.
 JAMES DURNIO, Crichtie, Inverurie.
 PETER GORDON, Balcraig Moor, Port William.
 GEORGE GRANT of Glenfarclas, Blackboat.
 JAMES HOPE, Eastbarns, Dunbar.
 A. W. HOWISON, Rannagulzion, Blairgowrie.
 J. E. KERR of Harviestoun, Dollar.
 JOHN KERR, Yorkston, Gorebridge, Midlothian.
 JAMES KILPATRICK, Craigie Mains, Kilmarnock.
 WILLIAM H. LAWSON, Frithfield, Anstruther.
 JAMES R. LUMSDEN of Arden, Dumbartonshire.
 THOMAS M'LAY, Dunvegan, Causewayhead, Stirling.
 RALPH S. MACWILLIAM, Garguston, Muir of Ord, Ross-shire.
 A. W. MONTGOMERIE, Westburn Farm, Cambuslang, Lanarkshire.
 ALEXANDER MURDOCH, East Hallside, Cambuslang, Lanarkshire.
 JOHN N. REID, Cromley Bank, Ellon.
 Captain IAN S. ROBERTSON, Linkwood, Elgin.
 Sir JOSHUA ROSS-TAYLOR, Mungoswalls, Duns.
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 T. MERCER SHARP, Bardrill, Blackford.
 Major ROBERT W. SHARPE, C.B.E., of The Park, Earlstoun.
 JOHN P. SLEIGH of St John's Wells, Fyvie.
 A. A. HAGART SPEIRS of Elderslie, Houston House, Renfrewshire.
 J. FAED SPROAT, Boreland of Anwoth, Gatehouse, Castle Douglas.
 Major Sir SAMUEL STRANG STEEL of Philiphaugh, Bt., Selkirk.
 MATTHEW TEMPLETON, Goshen Bank, Kelso.
 FRANCIS W. WALKER of Leys, Leys Castle, Inverness.
 T. G. WILSON, Carbeth Home Farm, Balfron Station.
 JAMES WYLLIE, Beaumont, Victoria Road, Dumfries.
 The EARL OF HOME, K.T., The Hirsell, Coldstream, Treasurer, *ex officio*.
 Colonel F. J. CARRUTHERS, C.B., of Dormont, Lockerbie, Honorary Secretary, *ex officio*.

5. IMPLEMENTS AND MACHINERY.

Sir JOSHUA ROSS-TAYLOR, Mungoswalls, Duns, *Convener*.
 JAMES PATON, Kirkness, Glencraig, *Vice-Convener*.
 R. SCOTT AITON, M.C., Legerwood, Earlstoun.
 J. W. ALEXANDER, M.V.O., of Newton, Golfhill, Moffat.
 ALEXANDER CORMACK (John Wallace & Sons, Ltd.), Sealladh-Mohr, Killearn.
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 JAMES DURNO, Crichtie, Inverurie.
 PETER GORDON, Balcraig Moor, Port William.
 JAMES HOPE, Eastbarns, Dunbar.
 J. E. KERR of Harviestoun, Dollar.
 JOHN KERR, Yorkston, Gorebridge, Midlothian.
 WILLIAM H. LAWSON, Frithfield, Anstruther.
 A. W. MONTGOMERIE, Westburn Farm, Cambuslang, Lanarkshire.
 ALEXANDER MURDOCH, East Hallside, Cambuslang, Lanarkshire.
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 JOHN P. SLEIGH of St John's Wells, Fyvie.
 J. FRED SPROAT, Boreland of Anwoth, Gatehouse, Castle Douglas.
 FRANCIS W. WALKER, of Leys, Leys Castle, Inverness.
 T. G. WILSON, Carbeth Home Farm, Balfron Station.
 JAMES WYLLIE, Beaumont, Victoria Road, Dumfries.
 Major R. F. BRENNER, The Leuchold, Dalmeny House, Edinburgh,
 Chairman of Board of Directors, *ex officio*.
 The EARL OF HOME, K.T., The Hirsell, Coldstream, Treasurer, *ex officio*.
 Colonel F. J. CARRUTHERS, C.B., of Dormont, Lockerbie, Honorary
 Secretary, *ex officio*.

6. SCIENCE.

Major ROBERT W. SHARPE, C.B.E., of The Park, Earlstoun, *Convener*.
 T. G. WILSON, Carbeth Home Farm, Balfron Station, *Vice-Convener*.
 R. SCOTT AITON, M.C., Legerwood, Earlstoun.
 J. W. ALEXANDER, M.V.O., of Newton, Golfhill, Moffat.
 DAVID BLAIR, Littleinch, Wormit, Fife.
 Major R. F. BRENNER, The Leuchold, Dalmeny House, Edinburgh.
 WILLIAM BROWN, Craigton, Bishopton, Renfrewshire.
 IAN M. CAMPBELL, Bal Blair, Invershin.
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 A. W. HOWISON, Rannagulzion, Blairgowrie.
 J. E. KERR of Harviestoun, Dollar.
 JAMES KILPATRICK, Craigie Mains, Kilmarnock.
 JAMES R. LUMSDEN of Arden, Dumbartonshire.

THOMAS M'LAY, Dunvegan, Causewayhead, Stirling.
 RALPH S. MACWILLIAM, Garguston, Muir of Ord, Ross-shire.
 A. W. MONTGOMERIE, Westburn Farm, Cambuslang, Lanarkshire.
 ALEXANDER MURDOCH, East Hallside, Cambuslang, Lanarkshire.
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 MATTHEW TEMPLETON, Goshen Bank, Kelso.
 FRANCIS W. WALKER of Leys, Leys Castle, Inverness.
 JAMES WYLLIE, Beaumont, Victoria Road, Dumfries.
 The EARL OF HOME, K.T., The Hirsell, Coldstream, Treasurer, *ex officio*.
 Colonel F. J. CARRUTHERS, C.B., of Dormont, Lockerbie, Honorary Secretary, *ex officio*.
 J. F. TOCHER, D.Sc., LL.D., F.I.C., 41½ Union Street, Aberdeen, Chemist, *ex officio*.
 A. E. CAMERON, M.A., D.Sc., University of Edinburgh, 10 George Square, Edinburgh, Consulting Zoologist, *ex officio*.

7. GENERAL PURPOSES.

Major R. F. BREBNER, The Leuchold, Dalmeny House, Edinburgh,
 Chairman of Board of Directors, *Convener*.
 R. SCOTT AITON, M.C., Legerwood, Earlston.
 J. W. ALEXANDER, M.V.O., of Newton, Golfhill, Moffat.
 DAVID BLAIR, Littleinch, Wormit, Fife.
 W. J. CAMPBELL, 61 Fountainhall Road, Edinburgh.
 ALEXANDER CLARK, Strathore House, Thornton, Fife.
 JAMES DURNIO, Crichtie, Inverurie.
 JAMES HOPE, Eastbarns, Dunbar.
 J. E. KERR of Harviestoun, Dollar.
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 JAMES PATON, Kirkness, Glencaig.
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 Major ROBERT W. SHARPE, C.B.E., of The Park, Earlston.
 MATTHEW TEMPLETON, Goshen Bank, Kelso.
 The EARL OF HOME, K.T., The Hirsell, Coldstream, Treasurer, *ex officio*.
 Colonel F. J. CARRUTHERS, C.B., of Dormont, Lockerbie, Honorary Secretary, *ex officio*.

8. EDUCATION.

Colonel F. J. CARRUTHERS, C.B., of Dormont, Lockerbie, Honorary Secretary, *Convener*.
 Major R. F. BREBNER, The Leuchold, Dalmeny House, Edinburgh,
 Chairman of Board of Directors.
 ALEXANDER MURDOCH, East Hallside, Cambuslang, Lanarkshire.
 Sir JOSHUA ROSS-TAYLOR, Mungoswalls, Duns.
 T. G. WILSON, Carbeth Home Farm, Balfon Station.
 JOHN STIRTON, 8 Eglinton Crescent, Edinburgh.

9. OFFICE-BEARERS.

Constitution : (1) The four Ordinary Directors for the Division in which the Show for the year is to be held (with the exception of one retiring next year) ; (2) one Ordinary Director from each of the other Show Divisions ; and (3) the Chairman of the Board, Treasurer, and Hon. Secretary, *ex officio*.

<i>Perth</i>	. JAMES PATON, Kirkness, Glencraig.
<i>Glasgow</i>	. ALEXANDER MURDOCH, East Hallside, Cambuslang, Lanarkshire.
<i>Aberdeen</i>	. JOHN P. SLEIGH of St John's Wells, Fyvie.
<i>Borders</i>	. Major ROBERT W. SHARPE, C.B.E., of The Park, Earlston.
<i>Stirling</i>	. JAMES R. LUMSDEN of Arden, Dumbartonshire.
<i>Dumfries</i>	. J. FAED SPROAT, Boreland of Anwoth, Gatehouse, Castle Douglas.
<i>Edinburgh</i>	. W. J. CAMPBELL, 61 Fountainhall Road, Edinburgh.
<i>Inverness</i>	. Major A. D. CAMPBELL, Stanstill, Wick.

Major R. F. BREBNER, The Leuchold, Dalmeny House, Edinburgh, Chairman of Board of Directors, *ex officio*.

The EARL OF HOME, K.T., The Hirsell, Coldstream, Treasurer, *ex officio*.

Colonel F. J. CARRUTHERS, C.B., of Dormont, Lockerbie, Honorary Secretary, *ex officio*.

REPRESENTATIVES ON OTHER BODIES.

National Agricultural Examination Board and National Dairy Examination Board.

Colonel F. J. CARRUTHERS, C.B., of Dormont, Lockerbie.
 Major R. F. BREBNER, The Leuchold, Dalmeny House, Edinburgh.
 ALEXANDER MURDOCH, East Hallside, Cambuslang, Lanarkshire.
 Sir JOSHUA ROSS-TAYLOR, Mungoswalls, Duns.
 T. G. WILSON, Carbeth Home Farm, Balfour Station.
 JOHN STIRTON, 8 Eglinton Crescent, Edinburgh.

Edinburgh and East of Scotland College of Agriculture.
 JOHN STIRTON, 8 Eglinton Crescent, Edinburgh.

West of Scotland Agricultural College.
 JAMES R. LUMSDEN of Arden, Dumbartonshire.

Aberdeen and North of Scotland College of Agriculture.
 J. F. TOCHER, D.Sc., LL.D., F.I.C., 41½ Union Street, Aberdeen.

Royal (Diok) Veterinary College.
 Major R. F. BREBNER, The Leuchold, Dalmeny House, Edinburgh.

Glasgow Veterinary College.

ALEXANDER MURDOCH, East Hallside, Cambuslang, Lanarkshire.

Animal Diseases Research Association.

Major R. F. BREBNER, The Leuchold, Dalmeny House, Edinburgh.

Scottish Milk Records Association.

JAMES KILPATRICK, Craigie Mains, Kilmarnock.

Captain IAN S. ROBERTSON, Linkwood, Elgin.

National Trust for Scotland.

Sir JOSHUA ROSS-TAYLOR, Mungoswalls, Duns.

Royal Scottish Agricultural Benevolent Institution.

Major R. F. BREBNER, The Leuchold, Dalmeny House, Edinburgh.

Association for the Preservation of Rural Scotland.

.....

Scottish Country Industries Development Trust

.....

.....

Scottish National Association of Young Farmers' Clubs.

JAMES PATON, Kirkness, Glencraig.

SCOTTISH PLANT REGISTRATION STATION.**Standing Committee of Management.**

Major R. F. BREBNER, The Leuchold, Dalmeny
House, Edinburgh.

JAMES HOPE, Eastbarns, Dunbar.

JAMES WITHER, Awhirk, Stranraer.

*Appointed for
5 years from 1st
January 1941.*

MEETINGS.

General Meetings.—By the Charter the Society must hold two General Meetings each year, and, under ordinary circumstances, they are held in the months of January and June, for the election of Members and other business. Twenty a quorum.

By a resolution of the General Meeting held on 15th January 1879, a General Meeting of Members is held in the Showyard on the occasion of the Annual Show.

With reference to motions at General Meetings, Bye-Law No. 19 provides that—"At General Meetings of the Society no motion or proposal (except of mere form or courtesy) shall be submitted or entertained for immediate decision unless notice thereof has been given two weeks previously to the Board of Directors, without prejudice, however, to the competency of a motion or proposal, of which due notice has not been given, being remitted to the Directors for consideration, and thereafter being disposed of at a future General Meeting."

Directors' Meetings.—The Board of Directors meet (except when otherwise arranged) on the first Wednesday of each month from November to June, inclusive, at 1.30 p.m., and occasionally as business may require, on a requisition by three Directors to the Secretary, or on intimation by him. Seven a quorum.

Committee Meetings.—Meetings of the various Committees are held as required.

Nomination of Directors.—Meetings of Members, for the purpose of nominating Directors to represent the Show Divisions on the Board for the year 1944-1945, will be held at the places and on the days after-mentioned :—

DIVISION.		
1. <i>Edinburgh.</i>	Market Buildings, Gorgie, Edinburgh	Wed., 26th Jan. 1944, at 1.
2. <i>Glasgow.</i>	Central Station Hotel, Glasgow	Wed., 9th Feb. 1944, at 1.
3. <i>Stirling.</i>	Golden Lion Hotel, Stirling	Thur., 10th Feb. 1944, at 1.30.
4. <i>Perth.</i>	Salutation Hotel, Perth	Fri., 11th Feb. 1944, at 2.
	(The Meeting will be held in 1945 at Perth in 1946 at Cupar.)	
5. <i>Borders.</i>	County Buildings, St Boswells	Thur., 17th Feb. 1944, at 3.
6. <i>Inverness.</i>	Station Hotel, Inverness	Tues., 22nd Feb. 1944, at 2.
7. <i>Aberdeen.</i>	Imperial Hotel, Aberdeen	Fri., 25th Feb. 1944, at 2.30.
8. <i>Dumfries.</i>	King's Arms Hotel, Dumfries	Wed., 8th March 1944, at 2.30.

The nomination of a Proprietor or other Member paying the higher subscription must be made in the 3rd, 6th, 7th and 8th Divisions; and the nomination of a Tenant-Farmer or other Member paying the lower subscription in the 1st, 2nd, 4th and 5th Divisions.

A Member who has served as an Ordinary Director for a term of four years is not eligible to be nominated again till after the lapse of at least one year. An Extraordinary Director may, however, be nominated as an Ordinary Director.

GENERAL SHOW.

Owing to the outbreak of War, the Board of Directors decided to cancel all Shows for the duration of the War.

EXAMINATIONS.

Agriculture.—The Examination in 1943 for the National Diploma in Agriculture will be held at the University of Leeds on Tuesday, 6th April, and following days. Applications close on Saturday, 20th February.

Dairying.—The Examination in 1943 (Scottish Centre) for the National Diploma in Dairying will be held at the Dairy School for Scotland, Auchincruive, Ayr: *Written*—On Wednesday, Thursday, and Friday, 8th, 9th, and 10th September. *Oral and Practical*—On Monday, 20th September, and following days. Applications close on Saturday, 31st July.

Forestry.—The Final Examination for the Society's First and Second-Class Certificates in Forestry was held in 1935.

In view of the institution of Examinations for Certificates and Diplomas in Forestry by the Royal Scottish Forestry Society, and by arrangement with that Society, the Board of Directors of the Highland and Agricultural Society of Scotland resolved in 1935 to cease holding further Examinations for the First and Second-Class Certificates, and that, in future, the granting of Certificates and Diplomas be left in the hands of the Royal Scottish Forestry Society.

All communications in connection with Examinations in Forestry should now be addressed to the Secretary, Royal Scottish Forestry Society, 8 Rutland Square, Edinburgh 1.

NATIONAL DIPLOMA IN AGRICULTURE

By a Supplementary Charter under the Great Seal, granted in 1856, the Society is empowered to grant Diplomas.

From 1858 to 1899 the Society held an annual Examination for Certificate and Diploma in Agriculture. In 1873 the Free Life Membership of the Society was granted to winners of the Diploma. In 1882 permission was given to holders of the Diploma to append the letters F.H.A.S. to their names. These arrangements terminated in 1899.

In 1898 it was resolved by the Royal Agricultural Society of England and the Highland and Agricultural Society of Scotland to discontinue the independent Examinations in Agriculture held by the two Societies, and to institute in their stead a Joint-Examination for a NATIONAL DIPLOMA IN AGRICULTURE (N.D.A.). This Examination is now conducted under the management of "The National Agricultural Examination Board" appointed by the two Societies. The first Joint Examination was held in 1900.

REGULATIONS FOR EXAMINATION IN THE SCIENCE AND PRACTICE OF AGRICULTURE

EXAMINATION IN 1943.

1. The Societies may hold conjointly, under the management of the National Agricultural Examination Board appointed by them, an Annual Examination in the Science and Practice of Agriculture, at a convenient centre.

2. Candidates who pass the Examination will receive the National Diploma in Agriculture—the Diploma to be distinguished shortly by the letters "N.D.A."

3. The Examination will be conducted by means of written papers and oral examinations.

4. In order to be eligible to sit for the Board's Examination in Agriculture, a candidate must—

(a) Present a certificate from a recognised Agricultural College that his attainments in the subjects of *General Botany, Geology, General Chemistry, Physics, and Mechanics*, as attested by class and other examinations, are, in the opinion of the authorities of the College, such as to justify his admission to the Board's Examination; *or*

(b) Produce evidence that he has passed the 1st B.Sc. or the Intermediate Examination in Science of a British University; *or*

(c) Present a School Certificate awarded by a British University Examination Board, and produce evidence that he has continued his study of science for at least a year and has obtained a certificate in Physics, Chemistry and Botany at the Higher Certificate Examination of a British University Examination Board; *or*

(d) Present a Leaving Certificate in Science (including Chemistry and Botany) of the Scottish Education Department.

5. In the case of students who satisfy the Board that they have not had the facilities for obtaining the foregoing certificates, the Board will be prepared to consider evidence of equivalent attainment. [Applications under this rule must be lodged *three months* before the date of the annual examination.]

6. *Before sitting for the PRACTICAL AGRICULTURE and FARM MACHINERY AND IMPLEMENTS papers, all candidates must produce evidence of possessing a practical knowledge of Agriculture obtained by residence on a farm in the British Isles for a period or periods (not more than two) covering a complete year of farming operations.*

7. Candidates will have the option of taking the whole of the following nine papers at one time, or of sitting for a group of *any three, four, or five* in the first year and the remaining subjects (at one examination) within the next two years:—

SUBJECT.	Maximum Marks.	Pass Marks.
1. Practical Agriculture (First Paper)	400	240
2. Practical Agriculture (Second Paper)	400	240
3. Farm Machinery and Implements	300	150
4. Land Surveying and Farm Buildings	100	50
5. Agricultural Chemistry	200	100
6. Agricultural Botany	200	100
7. Agricultural Book-keeping	200	100
8. Agricultural Zoology	100	50
9. Veterinary Science and Hygiene	200	100
	<hr/> 2100	<hr/> 1130

NOTE.—Candidates taking the Examination in two groups of subjects are recommended to take Agricultural Chemistry and Agricultural Botany in the first group.

8. A candidate who obtains not less than three-fourths (1575) of the aggregate maximum marks (2100) in the entire Examination will receive the Diploma with Honours, provided that he obtains not less than three-fourths (600) of the maximum marks (800) in the two Practical Agriculture papers.

9. Candidates electing to take the entire Examination at one time and failing in not more than three subjects may appear for these subjects in the following year. Failure in more than three subjects will be regarded as failure in the whole Examination.

10. In the case of candidates electing to take the Examination in two groups—

(a) A candidate appearing for a group of *three* subjects and failing in a single subject may, *in the case of a first group*, appear for that subject along with the second group, or, *in the case of a second group*, in the following year. Failure in more than one subject will be regarded as failure in the group.

(b) A candidate appearing for a group of *four* or more subjects and failing in not more than two subjects may, *in the case of a first group*, appear for these subjects along with the second group, or, *in the case of a second group*, in the following year. Failure in more than two subjects will be regarded as failure in the group.

11. Non-returnable fees must be paid by candidates as follows :—

Entire Examination	Six guineas.
Group of subjects	Three guineas.
Reappearance for any subjects . .	10/6 per subject.

12. The Board reserve the right to postpone, abandon, or in any way, or at any time, modify an Examination, and also to decline at any stage to admit any particular candidate to the Examination.

The Examination will take place at LEEDS UNIVERSITY on TUESDAY, 6TH APRIL 1943, and following days.

Forms of Application for permission to sit at the Examination may be obtained from "The Secretary, Royal Agricultural Society of England, 16 Bedford Square, London, W.C.1," or from "The Secretary, Highland and Agricultural Society of Scotland, 8 Eglinton Crescent, Edinburgh 12," and must be returned duly filled up not later than SATURDAY, 20TH FEBRUARY 1943.

SYLLABUS OF SUBJECTS OF EXAMINATION.

PRACTICAL AGRICULTURE.

I.—FIRST PAPER.

1. *British Farming*.—Arable, stock-raising, dairying—Approximate areas covered by the different systems—Typical examples of each—Area in Great Britain under chief crops—Numbers of live stock—The recent history of agriculture—Short summary of agricultural returns.

2. *Climate*.—The effect of climate on farming practice—Rainfall—Temperature—Prevailing winds—Weather forecasts.

3. *Soils*.—The influence of geological formations on the systems of farming—Classification of soils—Character and composition—Suitability for cultivation. Reclamation—Drainage—Irrigation—Warping—Application of lime and marl—Bare fallows—Tillage—Subsoiling—Deep and thorough cultivation.

4. *Manures*.—The manures of the farm—The treatment of farm-yard manure—The disposal of liquid manure and sewage—General manures—Special manures—Field trials of manures—The application of manures—Period of application and amounts used per acre—Unexhausted value of manures and feeding-stuffs.

5. *Crops*.—Wheat, barley, oats, rye, beans, peas, potatoes, turnips, swedes, mangolds, sugar beet, forage plants, hops, and other crops—Their adaptation to different soils and climates—Varieties—Selection of seed—Judging seeds—Cultivation, weeds and parasitic plants, best methods of prevention and eradication—Harvesting—Storing—Cost of production—Improvement of crops by selection and hybridising—Field trials—Methods which the farmer may adopt—Selection to resist disease—The principles of rotations—Rotations suitable for different soils and climates—Rotations and the maintenance of fertility—Green manuring—Leguminous crops in rotation—Catch crops—The advantages and disadvantages of rotations—Specialised farming—Management of Orchards.

2.—SECOND PAPER.

6. *Live Stock*.—The different breeds of British live stock—Their origin, characteristics, and comparative merits—Suitability for different districts—Breeding—General principles—Selection—Mating—Crossing—Rearing and general management—Breeding and rearing of horses, cattle, sheep, pigs, and poultry. Rearing colts and raising store stock—The foods of the farm—Their composition and suitability for different classes of stock—Purchased foods—Composition and special value—Rations for different kinds and ages of stock—Cost of producing beef, mutton, pork, and milk—Cost of feeding farm horses.

7. *The disposal of Crops, Produce, and Stock*.—Marketing grain and other crops—Sale of stock—Live weight—Dead weight.

8. *Milk*.—The production and treatment of milk—The manufacture of cheese, butter, &c.—The utilisation of by-products.

9. *Farming Capital*.—Calculations of the stocking and working of arable, stock, and dairy farms—Farm valuations—Rent and taxes.

10. *Labour*.—Organisation of labour—piece-work, time-work—labour costings.

11. *Renting a Farm*.—Indications of condition, productive power, and stock-carrying capacity—Leases—Conditions of occupancy.

N.B.—*It is essential that a candidate know his subject practically, and that he satisfy the Examiner of his familiarity with farm work and management.*

3.—FARM MACHINERY AND IMPLEMENTS.

1. *Power*.—The principle of action, construction, method of working, also care and management of steam engines and boilers, gas, oil and petrol engines and agricultural tractors. Cost and working expenses in connection with the above. Estimation of the brake horse-power of engines. Power derived from water. Measurement of the quantity of water flowing in a stream. General arrangement of water-power plants. Water-wheels. Turbines. Pumps—principle of action and construction. Flow of water through pipes. Hydraulic ram. Windmills.

2. *Agricultural Implements and Machinery*.—The mode of action and the general principles involved in the construction and working of farm implements and machinery. Arrangements of machinery with respect to the power plant. Pulleys and belting. Shafting and bearings. Lubrication. Lifting appliances. Strength and care of chains. Concrete and its use in the construction of simple foundations for engines and machines.

3. *Implements of Cultivation*.—Ploughs—Cultivators—Grubbers—Harrows—Drills. Manure Distributors. Seeding and planting implements.

4. *Implements of Harvesting*.—Mowing and Reaping machines—Rakes—Teddies—Elevators—Potato raisers.

5. *Implements of Transit*.—Carts, waggons, rick lifters, tractors.

6. *Threshing and Food-preparing Machinery.*—Threshing machines, stationary and portable—Screen Winnowers—Hummelers, Chaff cutters—Pulpers—Cake breakers.

7. *Dairy Appliances.*—Milking machines—Cream separators—Churns and other butter-working appliances—Milk delivery cans—Cheese-making utensils—Vats and presses.

N.B.—Candidates are expected to have had some experience with agricultural machinery and implements under actual working conditions, and to be capable of illustrating their answers, when necessary, by intelligible sketches or diagrams.

4.—LAND SURVEYING AND FARM BUILDINGS.

1. The use and adjustment of instruments employed in Surveying and Levelling other than the Theodolite.

2. Land surveying by chain, Plotting from field book, and determination of areas surveyed. The simpler "field problems."

3. Levelling and plotting from field book.

4. A knowledge of the various classes of maps published by the Ordnance Survey Department and their Scales.

5. *Roads and Fences.*—The construction and maintenance of farm roads, fences, and ditches.

6. *Land Drainage.*—Methods of draining; mole and pipe drains; cost of construction and maintenance.

7. *Buildings.*—Buildings required on different classes of farms—Economical arrangement of farm buildings—Materials—Construction—Ventilation—Drainage—Water supply—Dimensions of dairy, stables, cow-sheds, yard, courts, and piggeries—Accommodation for power—Implement, machinery, and cart sheds—Hay and grain sheds—Shelter sheds—Storage of manure.

N.B.—Each candidate should have with him at the Examination a pair of compasses, scales of equal parts, including scales of one chain to the inch, 4 feet to the inch, 8 feet to the inch, and the scale fitting the Ordnance Map, $\frac{1}{25000}$ or 25·344 inches to the mile, a small protractor, a set-square, and a straight-edge about 18 inches in length.

5.—AGRICULTURAL CHEMISTRY.

1. *The Atmosphere.*—Its composition and relations to plant and animal life.

2. *Water.*—Rain water—Soil water and drainage—Drinking water—Sewage and irrigation.

3. *The Soil.*—Origin, formation, and classification of soils—Sampling—Analysis—Composition of soils—The chemical and physical properties of soils—The water and air of the soil—Biological changes in the soil—The soil in relation to plant growth—Fertility—Causes of infertility—Improvement of soils.

4. *Manures.*—Theories of manuring—Classification of manures—Origin, nature, and characteristics of manures—Manufacture of

manures—Composition, analysis, adulteration, and valuation of manures—Farmyard manure and other natural manures—Green-manuring—Liming, marling, claying—Artificial manures, their origin and manufacture—Fertilisers and Feeding Stuffs Act—Sampling of manures.

5. *Poisons, Antiseptics, and Preservatives.*—General chemical composition and character of insecticides, fungicides, antiseptics, and preservatives used on the farm.

6. *Plants and Crops.*—Constituents of plants—Assimilation and nutrition of plants—Sources of the nitrogen and other constituents of plants—Germination—Action of enzymes—Composition and manurial requirements of farm crops—Food products derived from crops—Manuring experiments.

7. *Animals.*—Composition of animal body—Animal nutrition—Digestion—Assimilation, metabolism, respiration, and excretion.

8. *Foods and Feeding.*—Constituents of foods—Origin, nature, and composition of chief feeding stuffs—Sampling, analysis, and adulteration of foods—Nutritive value and digestibility of food—Functions of chief food constituents—Energy values—Vitamins—Relation of foods to the production of work, meat, milk, and manure—Manurial residues of foods.

9. *Dairy Chemistry.*—The composition of milk, cream, butter, cheese, &c.—Conditions which influence the composition of milk and milk products—Action of ferments and enzymes on milk and milk products—Milk-testing—Analysis and adulteration of dairy products.

N.B.—*Candidates who are in possession of Laboratory Notes are required to bring them to the Oral Examination in this subject.*

6.—AGRICULTURAL BOTANY.

In addition to a *general knowledge* of the morphology, histology, and physiology of plants, candidates will be expected to possess a *detailed knowledge* of the following subjects:—

The classification of plants of importance in agriculture as shown by a detailed study of the genera, species, and botanical varieties of the British Crop Plants and Weeds included in the following families:—

Ranunculaceæ.	Umbelliferae.	Chenopodiaceæ.
Cruciferae.	Compositæ.	Polygonaceæ.
Caryophyllaceæ.	Solanaceæ.	Liliaceæ.
Leguminosæ.	Scrophulariaceæ.	Gramineæ.
Rosaceæ.	Labiatae.	

British grasses of agricultural importance: recognition of, at any stage of growth. Habitats of important species. Constitution of the grass flora of good meadows and pastures. Composition of seed mixtures for temporary and permanent leys on various soils. The effects of artificial manures on the flora of grass land.

The weeds of arable and grass land. Poisonous and parasitic weeds. Methods of distribution by seed and vegetatively: of eradication. Weeds as soil indicators. Recognition of the seeds of the common weeds, particularly those characteristically found in clover, grass, &c., seed.

The chief varieties of wheat, barley, oats, clovers, roots, and other farm crops; their suitability for various climatic and soil conditions. The identification of the more important types of cereals by means

of their grain characters. Characteristics of good and bad samples of cereals.

Identification of materials used in feeding cakes and meals.

Plant-breeding. Principles of heredity in plants. Pure lines. Fluctuating variability. Selection.

Disease in plants. Diseases due to the effects of parasitic fungi. Resistance to disease: conditions affecting. Fungoid diseases scheduled from time to time by the Ministry of Agriculture and Fisheries.

Yeasts and fermentation.

The general outlines of bacteriology: nitrogen fixation, nitrification, and denitrification. Putrefaction and the bacteriology of milk, butter, and cheese.

N.B.—Candidates who are in possession of Laboratory Notes are required to bring them to the Oral Examination in this subject.

7.—AGRICULTURAL BOOK-KEEPING.

1. Advantages of book-keeping to the farmer. Difficulties and how they can be overcome. Objects of book-keeping.

2. General principles of book-keeping. Double-entry system. Description and use of various books. Ledger, journal, cash-book, petty cash-book, day-books, &c. Entering transactions; posting; trial balance; closing the accounts. Single-entry system.

3. Special ledger accounts: Interest, depreciation, rent and rates, improvements, private and household expenses, profit and loss and capital; partnership accounts.

4. Bank business. Opening a bank account. Use of cheques. Deposits and overdrafts.

5. General office work; correspondence, order notes, invoices, rendering accounts, receipts, &c. Filing systems.

6. Farm valuations for book-keeping purposes. Dates for stock-taking and principles of valuation. The farm balance-sheet.

7. Systems of farm book-keeping. Conditions that determine the most suitable system. Advantages and drawbacks of each system.

8. Accounts for the owner-occupier. Treatment of rent. Incidence of rates and tithe in England and Scotland, and their treatment as between farm and estate accounts. Improvements and upkeep and the general principles relating to maintenance claims.

9. Cost accounting. General principles and methods. Advantages, objects, difficulties.

10. Interpretation of results from ordinary and from cost accounts. Precautions necessary. Use of accounts as a guide to efficient management.

11. Income Tax. How the farmer is assessed. Preparation of Income Tax return. Treatment of Income Tax in accounts.

8.—AGRICULTURAL ZOOLOGY.

The Examination is designed to test practical knowledge, and therefore Candidates will be expected to recognise the animals of agricultural importance referred to in the Syllabus.

GENERAL.

A general knowledge of the characteristics of living animals and how they differ from plants.

One-celled animals, *e.g.*, Amoeba, and many-celled animals.

General outline of the classification of animals and the characters on which it is based.

Organic Evolution. Theories of Heredity.

SPECIAL.

I. *Invertebrates*.—A. The Worm Parasites of Stock. Flat and Round Worms. Structure and Life History, for example, of Liver-fluke, Tapeworm, Ascaris. The mode of life and life history of the chief worm enemies of the domesticated animals. Preventive and remedial measures.

B. The Arachnid enemies of Stock: Mange or Scab Mites, Demodex Mites, Ticks. External structure and life history. Control measures.

C. The Insect enemies of Stock: (a) External parasites, *e.g.*, gadflies, warble flies, blue-bottles, green-bottles, stable fly, ked, lice; (b) Internal parasites, *e.g.*, bot and warble flies.

D. Insects injurious to Crops: Structure and classification of insects. Mode of life and life history of the chief insect pests of agricultural crops.* Control, preventive and remedial measures—natural control; artificial control (Insecticides).

* The chief pests are detailed in Pamphlets issued by the Ministry of Agriculture and Fisheries.

E. Other invertebrates of agricultural importance, *e.g.*, earth-worms, eelworms, slugs and snails, centipedes and millepedes, gall mites.

II. *Vertebrates*.—Birds: the commoner birds of farm importance, their recognition and an estimate of their work.

Mammals: Outstanding characters for recognition, and the economic importance of:—

1. Ungulata or Hoofed Mammals, *e.g.*, horse, pig, cattle, sheep, deer.
2. Rodentia or Gnawing Mammals, *e.g.*, hares, rabbits, rats, mice, voles, squirrels.
3. Insectivora, *e.g.*, mole, hedgehog, shrew.
4. Carnivora, *e.g.*, dog, fox, polecat, stoat, weasel, badger.

N.B.—Candidates who are in possession of Laboratory Notes are required to bring them to the Oral Examination in this subject.

9.—VETERINARY SCIENCE AND HYGIENE.

1. Elementary anatomy and physiology of the horse, ox, sheep, and pig, and their relation to unsoundness and disease.

2. The general principles of breeding—including the physiology of reproduction, the laws of heredity, the periods of gestation, and the signs of pregnancy in the mare, cow, ewe, and sow.

3. Dentition as a means of determining the age of horses, cattle, sheep, and swine.

4. The management of farm stock in health and disease.

N.B.—Candidates who are in possession of Laboratory Notes are required to bring them to the Oral Examination in this subject.

WINNERS OF DIPLOMA IN 1942.*Diploma with Honours.*

JOHN BARRIE PAGE, Midland Agricultural College, Sutton Bonington, Loughborough.

Diploma.

PETER BADDILEY, Midland Agricultural College, Sutton Bonington, Loughborough.

GRAHAM STANLEY BOATFIELD, South-Eastern Agricultural College, Wye, Kent.

PETER MARRIOTT BRADLEY, Midland Agricultural College, Sutton Bonington, Loughborough.

JOHN COTTERILL, Harper Adams Agricultural College, Newport, Shropshire.

WILLIAM JOHN DALTON, University of Reading.

ROY DEDMAN, King's College, Newcastle-upon-Tyne.

GEORGE BRUCE DINSDALE, University of Leeds.

JOHN FINNEGAN, University of Leeds.

ROBERT FOSTER, University of Leeds.

JOHN HERRIES HAMILTON, West of Scotland Agricultural College, Glasgow.

JAMES YOUNG HOLMES, West of Scotland Agricultural College, Glasgow.

DAVID HAROLD JONES, University of Reading.

ROBERT DOUGLAS BROWN KIRKWOOD, West of Scotland Agricultural College, Glasgow.

HUGH CHARLES LARDER, Midland Agricultural College, Sutton Bonington, Loughborough.

ALVA LOUIS LAUSTE, South-Eastern Agricultural College, Wye, Kent.

DONALD ARCHIBALD M'INTYRE, West of Scotland Agricultural College, Glasgow.

ERIC WILLIAM TAYLOR MALCOLM, King's College, Newcastle-upon-Tyne.

JOHN EDWARD IRVING MARTIN, West of Scotland Agricultural College, Glasgow.

HAROLD MATTHEW MASON, University of Leeds.

ROBIN ROYCE MASON, Midland Agricultural College, Sutton Bonington, Loughborough.

GEORGE LUCKLEY MAUGHAN, South-Eastern Agricultural College, Wye, Kent.

GORDON MURRAY, University of Glasgow and West of Scotland Agricultural College.

JOHN RAYMOND PHILLIPS, Harper Adams Agricultural College,
Newport, Shropshire.

JOHN ROBERT POPE, Midland Agricultural College, Sutton Bonington,
Loughborough.

EDWARD WILLIAM DAVID ROSE, Harper Adams Agricultural College,
Newport, Shropshire.

JOYCE MARGARET ROWLEY, Midland Agricultural College, Sutton
Bonington, Loughborough.

NORMAN TAYLOR, Midland Agricultural College, Sutton Bonington,
Loughborough.

THOMAS WILLIAM TAYLOR, Midland Agricultural College, Sutton
Bonington, Loughborough.

PHILIP RADCLIFFE THORNE, University of Leeds.

THOMAS ATKINSON WEBSTER, University of Leeds.

ALEXANDER CRAIG WILKIE, West of Scotland Agricultural College,
Glasgow.

EXAMINATION PAPERS OF PAST YEARS.

Copies of papers set at past Examinations in AGRICULTURE, so far as available, may be had on application. Price 6d. per set.

Sets of N.D.A. Papers available are those for the years 1938, 1939, 1940 (April), 1940 (July), 1941, 1942.

NATIONAL DIPLOMA IN DAIRYING

This Examination, instituted in 1897, is conducted by "The National Dairy Examination Board," appointed jointly by the Royal Agricultural Society of England, the Highland and Agricultural Society of Scotland, and the British Dairy Farmers' Association.

REGULATIONS FOR EXAMINATION IN THE SCIENCE AND PRACTICE OF DAIRYING

EXAMINATION IN 1943.

1. The Societies may hold annually in England and Scotland, under the management of the National Dairy Examination Board appointed by them, one or more examinations for the National Diploma in the Science and Practice of Dairying, on dates and at places from time to time appointed and duly announced; the Diploma to be distinguished shortly by the letters 'N.D.D.'

2. Forms of entry for the Examination in England may be obtained from "The Secretary, Royal Agricultural Society of England, 16 Bedford Square, London, W.C.1." and must be returned to him duly filled up, with the entry fee, on or before 20th July 1943.

3. Forms of entry for the Examination in Scotland may be obtained from "The Secretary, Highland and Agricultural Society of Scotland, 8 Eglinton Crescent, Edinburgh 12," and must be returned to him duly filled up, with the entry fee, on or before 31st July 1943.

4. Any candidate may enter for the Examination either in England or Scotland, but not in both, and a candidate who has once taken part in an Examination in England cannot enter for an Examination in Scotland, or *vice versa*. *An exception may be made in favour of a candidate reappearing under Regulation 10 (3) provided special application is made at the time of entry.*

5. As a preliminary to the acceptance of any application for permission to enter for the Examination, a candidate must produce:—

(1) from the Head of an approved Dairy Training College or Institute:

(a) a statement that he or she is in possession of the General School Certificate (England), the Day School Certificate Higher (Scotland), or the School Certificate of the Central Welsh Board; or a statement that his or her general education is of an equivalent standard;

- (b) a certificate testifying that he or she has satisfactorily completed courses in (i) soils, crops, rotations, cultivations, manuring of crops (other than pastures), and plant physiology; (ii) elementary chemistry, physics and mechanics, and
 - (c) that he or she has also attended a Diploma or Degree course in the subjects of the Examination covering at least two academic years at an approved Dairy Training College or Institute, and has satisfied the authorities of the College or Institute of his or her fitness for admission to the Examination. *This period shall include six months' instruction (consisting of not more than two periods) in practical dairy work.*
 - (d) a certificate of proficiency in soft cheese-making.
- (2) a certificate of proficiency in the milking of cows, signed by a dairy farmer, and evidence that he or she has spent at least six months in not more than two periods on an approved dairy farm and taken part in the work, both in the dairy and on the land. *This period must not run concurrently with the six months' practical training referred to in sub-section 1 (c).*
A Dairy Farm to be approved must have not fewer than fifteen cows in milk.

6. A candidate who has already taken a Degree in Agriculture of a British University, or a Diploma in Agriculture recognised by the National Dairy Examination Board, will be allowed to enter for the National Diploma in Dairying Examination after one year's subsequent training at an approved Dairy Training College or Institute, providing that such course includes at least six months' training in practical dairy work, and that he or she has spent at least six months on an approved dairy farm, and taken part in the work both in the dairy and on the land.

7. In the Examination a candidate will be required to satisfy the Examiners by means of written papers, practical work, and *viva voce*, that he or she has :—

- (1) A general knowledge of the management of a dairy farm, including the rearing and feeding of dairy stock, the candidate being required to satisfy the Examiners that he or she has had a thorough training and practical experience in all the details of dairy work as pursued on a farm.
- (2) A thorough acquaintance with the practical details of the management of a dairy, and the manufacture of butter and cheese, together with a working knowledge of the scientific principles involved in these operations.
- (3) A general knowledge of dairy book-keeping.
- (4) Practical skill in dairying, to be tested by the making of butter and cheese.

NOTE.—A candidate must be prepared to make any one of three varieties of Hard Pressed Cheese, two of which must be Cheddar and Cheshire, these three to be specified on his application form, the Examiner in Cheese-making having the option of saying, during the Examination, which a candidate shall make.

8. Candidates will have the option of :—

- (a) Taking the whole Examination at one time ; or
- (b) Taking the Examination in two parts.

A candidate taking the Examination in two parts must take the following subjects at the first sitting: DAIRY HUSBANDRY, MILK AND MILK PLANT, CREAM AND BUTTER, CHEESE AND CHEESE PRODUCTS, PRACTICAL CHEESE-MAKING AND BUTTER-MAKING; the remaining three Papers, DAIRY CHEMISTRY, DAIRY MICROBIOLOGY, and DAIRY BOOK-KEEPING, at the Examination in the following year.

9. The maximum marks obtainable and the marks required for a pass in each subject are :—

WRITTEN AND ORAL EXAMINATION—		Max.	Pass.
Dairy Husbandry . . . (3 hours' paper)		150	90
Milk and Milk Plant . . . (2 hours' paper)		100	60
Cream and Butter . . . " "		100	60
Cheese and Cheese Products . . . " "		100	60
Dairy Chemistry . . . " "		100	60
Dairy Microbiology . . . " "		100	60
Dairy Book-keeping . . . (3 hours' paper)		100	50
PRACTICAL EXAMINATION—CHEESE-MAKING—			
(a) One of the three Hard Pressed cheeses specified by the candidate on his form of application		200	150
(b) Blue-veined		100	75
BUTTER-MAKING		200	150
		<hr/> 1250	<hr/> 815

Honours will be awarded to candidates obtaining an aggregate of 80 per cent (1000) of the maximum marks (1250) in the Examination, provided that they also obtain at least 80 per cent (360) of the maximum marks (450) in the Dairy Husbandry, Milk and Milk Plant, Cream and Butter, and Cheese and Cheese Products papers.

10. A candidate taking the whole Examination at one time :—

- (1) who fails in any part of the practical examination shall fail in the whole examination.
- (2) who fails in four or more subjects of the written examination shall fail in the whole examination.
- (3) who, having passed in the practical examination, fails in not more than three subjects of the written examination may, at the discretion of the Board, appear for those subjects in the following year.

11. A candidate taking the Examination in two parts, and failing in a single subject in the first part of the Examination, may, at the discretion of the Board, appear for that subject along with the second part; or, in the case of a single subject of the second part, in the following year.

Failure in more than one subject will be regarded as failure in that part of the Examination. Failure in any part of the Practical Examination will entail complete failure.

12. In all cases of failure, either in the whole Examination or in part thereof, the Board will require evidence of further study before a candidate is again admitted to the Examination.

13. The entrance fees will be as follows :—

For the whole Examination taken at one time	. £3	3	0
For the Examination taken in two parts :			
First part	. . . . .	3	3
Second part	. . . . .	1	1
For reappearance, 10s. 6d. each subject.			

14. The Board reserve the right to postpone, to abandon, and to modify an Examination, and also to decline to admit any particular candidate to the Examination.

DATES OF EXAMINATIONS IN 1943.

SCOTLAND.—At the Dairy School for Scotland, Auchinervie, Ayr.
WRITTEN—WEDNESDAY, THURSDAY, and FRIDAY, 8th, 9th and 10th September. **ORAL AND PRACTICAL**—MONDAY, 20th September, and following days. Last date for receiving Applications, SATURDAY, 31st JULY.

ENGLAND.—At the University and British Dairy Institute, Reading.
 WEDNESDAY, 8th September, and following days. Last date for receiving Applications, TUESDAY, 20th JULY.

SYLLABUS OF SUBJECTS OF EXAMINATION

I.—DAIRY HUSBANDRY.

Buildings of the dairy farm ; structural features, sanitation, and water supply.

Selection, stocking, and equipment of typical dairy farms ; organisation of the dairy farm.

The utilisation of the crops of the dairy farm.

Pastures and pasture management ; dried grass, silage.

Foods used on the dairy farm ; characteristics and relative value.

Live stock of the dairy farm ; essential conformation features of the dairy cow and dairy bull ; British dairy breeds ; milk recording.

Breeding of dairy stock, principles and practice ; selection, care, and management of the sire ; calf rearing ; raising of dairy heifers.

Management of dairy herds ; self-contained herds ; attested herds.

Feeding of dairy cows for milk production ; feeding standards ; construction and use of rations.

Common ailments and diseases of dairy stock : milk fever, bloat, cow pox, mastitis, contagious abortion, tuberculosis, Johne's disease, sterility, scour, hoose, notifiable animal diseases.

Hygienic milk production ; hand and machine milking ; cleaning and care of milking machines and utensils used in milk production ; milk coolers and farm sterilising equipment.

Pigs on the dairy farm ; suitable breeds for bacon and for pork production ; housing accommodation ; breeding, feeding, and management of pigs ; fattening of pigs ; pig-recording ; common ailments and diseases of pigs.

II.—MILK AND MILK PLANT.

Utilisation of milk and milk products in Great Britain ; sources of supply ; the principles of organised marketing. Milk contracts.

Properties of milk.

Variations in the composition of milk ; legal minimum standards for milk ; statutory rules and orders relating to milk and milk products.

Sources of taints and contamination in milk. Abnormal milk. Flavour in milk and the contributing factors.

Grades of milk.

Food value of milk. Hard and soft curd milk.

Transportation of milk ; milk churns ; road and rail tanks ; processing of milk at milk depots ; sampling and testing of milk ; effects of heat on milk ; essentials for efficient pasteurisation ; progressive stages in milk treatment at milk plants ; weighing ; filtering ; clarifying, pumping, pasteurising, cooling, bottling, and capping ; refrigeration ; cold storage.

Disposal of wastes from milk plants.

Distribution of milk.

Special treatment of milk ; homogenisation, irradiation, stassanisation, commercial sterilisation, high temperature, short time heat treatment.

Fermented milk preparations, Yoghurt, Kefir, and cultured butter milk.

Elementary principles of condensing and drying of milk.

III.—CREAM AND BUTTER.

Cream.—Production and consumption of cream in Great Britain. Utilisation of cream ; grades of cream, regulations for the sale of cream ; different methods of obtaining cream from milk.

Operation and management of cream separators, hand and power.

Efficiency of separation ; cleaning and sterilisation of separators.

Testing of cream.

Factors influencing the flavour, physical properties, and keeping qualities of cream ; homogenisation of cream.

Pasteurisation of cream ; cooling and storage ; marketing of cream.

Cream preparations ; whipped cream, clotted cream, sterilised cream, reconstituted cream.

Cream appliances, homogenisers, cream sterilising plant, pasteurisers, cream-coolers.

Ice Cream.—Types of plant used. Materials used in, and preparation of mixes. Pasteurising, ripening, freezing, and hardening.

Butter.—Production and consumption of butter in Great Britain; sources of imports.

Food value of butter; regulations governing the production and sale of butter.

Selection and grading of cream for butter-making.

Treatment of cream prior to churning; heating, cooling; preparation and use of starters.

Churning of cream; factors affecting churning and loss of butter fat.

Washing of butter; purity of wash water.

Methods of working and salting of butter; quality of salt.

Packing of butter and treatment of liners and butter boxes; storage of butter; refrigeration in factories and in transport.

Grading and judging butter. National Mark butter. Common defects in butter and their causes.

Special systems of butter-making; sweet cream butter; whole milk butter; neutralised cream butter; whey butter.

Utilisation of by-products of butter-making; separated milk and butter milk. Casein.

Butter-making equipment; separators; pasteurising plant, cream coolers, cream pumps, starter-preparing apparatus, cream ripeners, churns and butter workers. Butter packers, moulders and blenders, butter cutting, and wrapping machines.

IV.—CHEESE AND CHEESE PRODUCTS.

Production and consumption of cheese in Great Britain; sources of imports.

Food values of cheese.

Principles of cheese-making; varieties of cheese.

Hard-pressed cheese. Agents used in manufacturing process; starter, colour, rennet, salt.

Milk for cheese-making; care and management.

Detailed knowledge of the manufacture of Cheddar and Cheshire, and one of the following: Derby, Dunlop, Leicester, Gloucester, or Lancashire.

Manufacture of cheese from pasteurised milk.

Small hard-pressed cheeses: Caerphilly, Smallholder, &c.

Difficulties experienced in the manufacturing process; causes of fast and slow working, gas formation, ropy and slimy whey.

Ripening and storage of cheese.

Grading and judging of cheese; National Mark standards.

Marketing of cheese.

Defects in the flavour, body, and texture, and in the colour of mature cheese.

Manufacture of Stilton and Wensleydale cheeses, blue-veined and white.

Soft cheese-making.

Cream cheeses. Single and double cream cheeses.

Cheese products. Manufacture of processed cheese, and cheese spreads.

Usual cheese factory equipment and arrangement; cheese vats,

curd knives, curd agitator, cheese press, curd mill; cheese hoops, cheese turners, paraffining apparatus, pastourising equipment, air conditioning plant.

Utilisation of whey.

V.—DAIRY CHEMISTRY.

The principal constituents of foodstuffs and the functions they fulfil. Assimilation and digestion. Vitamins.

The nature and composition of milk, colostrum, butter, cheese, cream, separated milk, butter milk, whey, casein, and lactose.

Drying and condensation of milk and milk products.

Variation in composition of milk.

Milk souring, rennet coagulation, preparation and ripening of cheese, storage of butter, salt for dairy purposes.

Metals and their influence on milk and milk products. Taints. Effects of heat on milk. Abnormal milk.

The sampling and analysis of milk and milk products. Freezing point test for milk.

Commercial routine analysis of foodstuffs.

Chemical aspects of water supply.

Dairy detergents and disinfectants.

N.B.—Candidates are required to bring to the Oral Examination in this subject their Laboratory notebooks certified by their teachers as being the record of their Laboratory work carried out during the course.

VI.—DAIRY MICROBIOLOGY.

GENERAL.—The bacteria, yeasts, and moulds which commonly occur in milk and dairy products; their form, classification (in the case of the bacteria—Topley and Wilson's), growth and reproduction. Factors which control rate of growth. Fermentations of importance in dairying; causal micro-organisms and conditions which influence activity.

MILK.—Microbiology of milk production; sources of contamination, their relative importance and organisms derived from them. Normal changes produced by micro-organisms in milk. Abnormal changes; ropiness, premature curdling, gas formation, bitter, yeasty and malty flavours and flavour of roots and feeding-stuffs; causal organisms and methods of prevention. Effects of straining, centrifuging, cooling, heating, condensing, drying, and preservatives on the microflora of milk. Bacteriology of pasteurised and sterilised milk; influence of quality of raw milk. Standards for graded milks.

MILK PRODUCTS.—Starters; their propagation and management. Ripening of cream; development of normal flavour. Microbiology of butter. Ripening of hard, soft, and blue-veined cheese; factors concerned and their control. Microbiology of condensed, dried, and fermented milks. Defects of dairy products, causal organisms and

preventive measures ; butter defects—rancidity, yeasty and cheesy flavours, coloured spots ; cheese defects—gas formation, bitterness, slow acid development and excessive acidity, colour changes ; defects of condensed milk—gas formation, “ buttons,” coagulation.

DISEASES.—Diseases which may be conveyed by milk ; sources of infection. Bacteriology of tuberculosis, contagious abortion, mastitis and methods of detection. Immunity ; vaccines. Disinfection.

WATER.—The importance of a pure water supply for the dairy and the herd. Bacteria commonly present in natural waters. Sources of contamination, the effect of pollution with sewage, water-borne disease.

LABORATORY WORK.—The microscope and its use. Staining (including Gram and Ziehl-Neelsen methods), and microscopic examination of micro-organisms. Methods of isolation and cultivation. Preparation of bile-salt broth, milk, milk agar, and Wilson’s agar. Methods for the examination of milk ; plate method, post-pasteurisation count, coliform test, Breed’s method and the methylene blue reduction, fermentation, acidity and catalase tests. Methods for tracing sources of contamination and of milk faults. Detection of thermophilic, thermoduric, and pathogenic organisms in milk. Examination of water supplies.

N.B.—Candidates are required to bring to the Oral Examination in this subject their Laboratory notebooks certified by their teachers as being the record of their Laboratory work carried out during the course.

VII.—DAIRY BOOK-KEEPING.

Reasons for keeping accounts on the farm and in the dairy factory.

General principles of double-entry book-keeping. Use of day-book, journal, ledger, cash-book, and petty-cash book. Preparation of profit and loss account, capital account, and balance-sheet. Adjustments necessary for the owner-occupier.

Analysis cash-book.

Valuations.—Basis of valuations for accounting purposes on the farm and in the dairy factory. Dates for stock-taking.

Methods of accounting suitable for dairy farms with varying systems of milk disposal.

Opening a bank account. Cheques, deposits, and overdrafts.

Assessment of the farmer for Income Tax purposes.

WINNERS OF DIPLOMA IN 1942.

SCOTTISH CENTRE.

(All the candidates at the Scottish Centre had been students at the Dairy School for Scotland, Auchincruive, Ayr.)

Diploma.

- ELIZABETH JANE MARGARET ALEXANDER, Coutens, Oldmeldrum, Aberdeenshire.
 CHRISTIAN STALKER CAMERON, Inverardoch Mains, Dunblane, Perthshire.
 ANNE BEATRICE DURIE, Glenlochar House, Castle-Douglas, Kirkcudbrightshire.
 GEORGE LESLIE ERNST, "Roseton," Divulpitiya, via Borelesgamuwa, Colombo, Ceylon.
 AMELIA EDITH FLYNN, 9 Derwent Gardens, Low Fell, Gateshead 9, Co. Durham.
 JOHN HERBES HAMILTON, 60 Gala Street, Riddrie, Glasgow.
 RODERICK SEYMOUR HOBSON, 24 Wood Lane, Ashenhurst, Huddersfield.
 WILLIAM HOLMES, Gladstone, Kilbarchan, Renfrewshire.
 MURIEL ANN KERR, Parkfield, Styal, Wilmslow, Cheshire.
 ISOBEL THOMSON LINDSAY, North Hirst Farm, Harthill, Lanarkshire.
 DONALD ARCHIBALD M'INTYRE, Gortans, Isle of Bute.
 CATRIONA MARY MACLEAN, 26 Hallhill Road, Springboig, Glasgow, E.2.
 PETER WATSON MILLIGAN, Shawland, Arthur Avenue, Airdrie, Lanarkshire.
 MURIEL ROBINSON, Hazlewood Cottage, Bolton Abbey, Skipton, Yorks.
 JOAN STODDART, Perwinnes, Dyce, Aberdeenshire.
 ELENORA GRANT TODD, 21 Braidburn Terrace, Edinburgh 10.
 ERIC WATKINSON, Gwynant, Mill Place, Brigg, Lincs.

ENGLISH CENTRE.

Diploma.

- LUCY CATHERINE ANDREW, The University and British Dairy Institute, Reading.
 DAVID ALEXANDER BOWIE, The University College of Wales, Aberystwyth.
 MRS ROSEMARY BROWN, Midland Agricultural College, Sutton Bonington, Loughborough.
 ALAN FREDERICK CLAPHAM, Midland Agricultural College, Sutton Bonington, Loughborough.
 MOIRA CATHERINE CLARK, The University and British Dairy Institute, Reading.
 PHYLLIS ISOBEL COULTHARD, The University and British Dairy Institute, Reading.

- DERRICK THOMAS KING, The University and British Dairy Institute, Reading.
- ELEMER KRAMER, The University and British Dairy Institute, Reading.
- DOROTHY LAMBERT, Midland Agricultural College, Sutton Bonington, Loughborough.
- BETTY LEWIS, Midland Agricultural College, Sutton Bonington, Loughborough.
- NESTA MYFANWY LEWIS, The University and British Dairy Institute, Reading.
- Mrs RITA VERNON LEWIS, Midland Agricultural College, Sutton Bonington, Loughborough.
- THOMAS JOHN LEWIS, The University College of Wales, Aberystwyth.
- MARY FRANCES ELIZABETH LOXTON, The University and British Dairy Institute, Reading.
- GEORGINA BARBARA MARTIN, Midland Agricultural College, Sutton Bonington, Loughborough.
- EDITH HARRIET MILDON, The University and British Dairy Institute, Reading.
- OLIVE RACHEL NEWTON, Midland Agricultural College, Sutton Bonington, Loughborough.
- NELLY MARY RIDDELL, The University and British Dairy Institute, Reading.
- AUDREY RIDDELSDELL, The University and British Dairy Institute, Reading.
- GAMAL ELDINE MOHAMMED EL-SADEK, The University and British Dairy Institute, Reading.
- JOHN LESLIE SAMUEL SHUCKSMITH, Midland Agricultural College, Sutton Bonington, Loughborough.
- JEAN DENISE TAYLER, The University and British Dairy Institute, Reading.
- GWYNETH VAUGHAN-DAVIES, The University and British Dairy Institute, Reading.
- CICELY ETHEL WATTS, The University and British Dairy Institute, Reading.
- HELEN RACHEL BARBARA WHITE, The University and British Dairy Institute, Reading.
- ELIZABETH ANNIE WILLETT, Midland Agricultural College, Sutton Bonington, Loughborough.

EXAMINATION PAPERS OF PAST YEARS.

Copies of papers set at past Examinations in Dairying may be had on application. Price 6d. per set. Papers available are those for the years 1937-1942 inclusive.

CERTIFICATES IN FORESTRY

In 1870 the Society instituted an Examination in Forestry, and granted First and Second-Class Certificates respectively to such students as attained a certain standard of proficiency in the following subjects. Candidates were required to possess a thorough acquaintance with the theory and practice of Forestry, and a general knowledge of the following branches of study, so far as these applied to Forestry: (a) the elements of Forest Botany and Forest Zoology; (b) the elements of Meteorology and Geology; (c) Forest Engineering; and (d) Arithmetic and Book-keeping.

Holders of the First-Class Certificate were entitled to become free Life Members of the Society.

In view of the institution of Examinations for Certificates and Diplomas in Forestry by the Royal Scottish Forestry Society, and by arrangement with that Society, the Board of Directors of the Highland and Agricultural Society of Scotland resolved in 1935 to cease holding further Examinations for the First and Second-Class Certificates, and that, in future, the granting of Certificates and Diplomas be left in the hands of the Royal Scottish Forestry Society.

The list of students who obtained the Highland and Agricultural Society's Certificates in Forestry prior to 1899 appears in the 'Transactions' for the year 1899. A further list of those obtaining Certificates between 1899 and 1935 inclusive appears in the 'Transactions' for the year 1935. The total number of Certificates granted since the commencement of the Examination in 1870 was as follows: First-Class, 43; Second-Class, 38.

VETERINARY CERTIFICATES AND MEDALS

The Society established a Veterinary Department in 1823, but by an arrangement made with the Royal College of Veterinary Surgeons, the Society's examination ceased in 1881. Holders of the Society's Veterinary Certificate are entitled to become members of the Royal College of Veterinary Surgeons on payment of certain fees, without being required to undergo any further examination. The number of students who passed for the Society's Certificate is 1183.

The Society gives annually a limited number of silver medals for Class competition to each of the two Veterinary Colleges in Scotland—the Royal (Dick) Veterinary College, Edinburgh, and the Glasgow Veterinary College, Glasgow.

ENTOMOLOGICAL DEPARTMENT

Consulting Zoologist to the Society—A. E. CAMERON, M.A., D.Sc.,
Department of Agricultural and Forest Zoology, University of
Edinburgh, 10 George Square, Edinburgh.

REPORTS ON THE ANIMAL ENEMIES OF CROP PLANTS AND LIVE STOCK (INCLUDING POULTRY).

The Consulting Zoologist is prepared to send to any Member of the Society a Report on damage to, or diseases of, plants and animals due to animal agency (Insects, Mites, Worms, Snails, Slugs, Birds, and the Smaller Mammals), and will advise Members regarding insects or allied animals which, in any stage of their development, infest—

- | | |
|-----------------------------------|-------------------------------------|
| (a) Farm crops. | (d) Fruit and fruit trees. |
| (b) Stored grain and foodstuffs. | (e) Forest trees and stored timber. |
| (c) Garden and greenhouse plants. | (f) Live stock (including poultry). |

Any Member consulting Dr Cameron should give him full particulars of the damage or disease upon which his advice is desired. In addition, there should be sent to him specimens of the injured plants, or the injured parts of plants, &c., as well as specimens of the insects or animals believed to be the cause of the injury.

Specimens should be sent in tin or wooden boxes, or in quills, in order to prevent injury in transmission.

The Directors have fixed the fee payable by Members to Dr Cameron at 2s. 6d. for each case upon which he is consulted : this fee should be sent to him along with the application for information.

Letters and parcels (carriage or postage paid) should be addressed to A. E. Cameron, Esq., M.A., D.Sc., Department of Agricultural and Forest Zoology, University of Edinburgh, 10 George Square, Edinburgh.

CHEMICAL DEPARTMENT

Chemist to the Society—J. F. TOCHER, D.Sc., LL.D., F.I.C.,
Crown Mansions, 41½ Union Street, Aberdeen.

The object of the Chemical Department is to promote the diffusion of a knowledge of Chemistry as applied to agriculture among the members of the Society, to carry out experiments for that purpose, to assist members who are engaged in making local experiments requiring the direction or services of a chemist, to direct members in regard to the use of manures and feeding-stuffs, to assist them to put the purchase of these substances under proper control, and in general to consider all matters coming under the Society's notice in connection with the Chemistry of Agriculture.

MEMBERS' PRIVILEGES IN RESPECT TO ANALYSES.

The Directors are anxious to take any steps in their power to expose the vendors of inferior fertilisers and feeding-stuffs, and the members can give them assistance in this by supplying to the Chemist, when sending samples for analysis, information as to the guarantee, if any, on which the goods were sold, and also as to the price charged.

These charges apply only to analyses made for agricultural purposes, and for the sole and private use of members of the Highland and Agricultural Society who are not engaged in the manufacture or sale of the substances analysed.

Valuations of manures, according to the Society's scale of units, will be supplied if requested.

The Society will not be liable for payment of fees in respect of analyses for any member in excess of £5 for any one year, or £10 for any five consecutive years.

The undernoted fees are those payable by a member. These amounts represent only one-third of the total fee for any particular analysis, the other two-thirds being paid by the Society.

This scale does not apply to members whose subscriptions are in arrears.

FERTILISERS AND FEEDING-STUFFS.

- | | |
|---|------|
| (1) The determination of one ingredient in a single sample of a <i>manure</i> or of a <i>feeding-stuff</i> | 3/6 |
| (2) The determination of two ingredients in a single sample of a <i>manure</i> or of a <i>feeding-stuff</i> | 5/- |
| (3) The complete analysis of a sample of a <i>manure</i> or of a <i>feeding-stuff</i> | 10/- |

For example—

For one ingredient only.

Linseed and other cakes, for oil or for albuminoids . . .	3/6
Feeding meals, ground cereals, for oil or for albuminoids . . .	
Bone meals, for nitrogen or for total phosphate . . .	
Compound manures, for nitrogen or for soluble phosphate or for insoluble phosphate or for potash . . .	
Superphosphate, for soluble phosphate or for insoluble phosphate . . .	
Ground mineral phosphate, for insoluble phosphate or for citric soluble phosphate . . .	
Slag phosphate, for insoluble phosphate or for citric soluble phosphate . . .	

For two ingredients only.

Any two ingredients of a manure or of a feeding-stuff . . .	5/-
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For a complete analysis.

For manures, the proportions of nitrogen (nitrogen included as nitrates or as ammonia compounds), soluble phosphate, insoluble phosphate, potash ; For feeding-stuffs, the proportions of oil, albuminoids, carbohydrates, iodine, mineral matter, fibre and moisture . . .	10/-
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- | | |
|---|-----|
| (4) Ground Limestone, for carbonic acid and calcium, two determinations . . . | 5/- |
| (5) Ground Lime, for percentage of calcium oxide . . . | 3/6 |

AGRICULTURAL PRODUCTS.

- | | |
|---|------|
| (6) Turnips, sugar beet, for total sugar . . . | 5/- |
| (7) Turnips, sugar beet, for oil, albuminoids, sugar, mineral matter, fibre and moisture . . . | 10/- |
| (8) Grass, hay, ensilage, grain, &c., for oil, albuminoids, carbohydrates, mineral matter, fibre and moisture . . . | 10/- |
| (9) Grain, for carbohydrates and moisture . . . | 5/- |

MILK AND MILK PRODUCTS.

- | | |
|---|-----|
| (10) Milk, fresh, for butter fat only, by Gerber process . . . | 1/- |
| (11) Milk, fresh, for butter fat, by Gerber, and solids not fat . . . | 2/6 |
| (12) Milk, sour sample, for butter fat, and solids not fat. Soxhlet extraction and Government Laboratory method for sour sample . . . | 5/- |
| (13) Milk, for preservatives, borates, sulphur dioxide, hydrogen peroxide, formalin . . . | 5/- |
| (14) Butter, for true butter fat and moisture (Reichert), for genuineness . . . | 5/- |
| (15) Butter, for true butter fat (Reichert), moisture, foreign fat, preservatives . . . | 7/6 |

WATER AND LIQUID SUBSTANCES.

Cases containing bottles for water samples and instructions for sampling are sent from the laboratory on application.

- | | |
|--|------|
| (16) Supply of water at farm, for total solids, free ammonia, albuminoid ammonia, nitrites, nitrates, hardness, for fitness for domestic use or potability . . . | 12/6 |
| (17) Supply of water at farm, for potability as above, and for proportions of mineral constituents, lead, copper, acidity pH value, action of water on lead (plumbo solvency), action of water on copper . . | £1 |
| (18) Farm-yard manure, liquid manure, for nitrogen, potash, phosphates, and proportion of other mineral substances | £1 |

MISCELLANEOUS.

- | | |
|---|---------|
| (19) Feeding oils and fats, for composition and quality . . | 10/- |
| (20) Search for proportion of arsenic in feeding-stuff . . | 10/- |
| (21) Search for proportion of lead in feeding-stuff . . | 10/- |
| (22) Search for arsenic or any one poison in feeding-stuff . . | 10/- |
| (23) Search for proportion of any one poison in viscera . . | 10/- |
| (24) Search for poisons in food or in viscera, and proportion of poison found | £1 10/- |
- (Veterinary surgeons are not entitled to have searches made for poisons in food or viscera under the Society's scheme for clients who are not members of the Society.)*
- | | |
|--|------|
| (25) Proportion of arsenic in sheep dips or insecticides . . | 10/- |
| (26) Proportion of carbolic acid in sheep dips or insecticides . . | 5/- |
| (27) Proportion of tar acids in sheep dips or insecticides . . | 10/- |
| (28) Insecticides, foot rot pastes and other agricultural remedies for live stock and farm produce | £1 |

*Samples should be sent (carriage paid) to Dr J. F. TOCHER,
Crown Mansions, 41½ Union Street, Aberdeen.*

INSTRUCTIONS FOR SELECTING SAMPLES FOR ANALYSIS.

MANURES.

Any method of sampling mutually agreed upon between buyer and seller may be adopted, but the following method is recommended as a very complete and satisfactory one: Four or more bags should be selected for sampling. Each bag is to be emptied out separately on a clean floor, worked through with the spade, and one spadeful taken out and set aside. The four or more spadefuls thus set aside are to be mixed together until a uniform mixture is obtained. Of this mixture one spadeful is to be taken, spread on paper, and still more thoroughly mixed, any lumps which it may contain being broken down with the hand. Of this mixture two samples of about half a pound each should be taken by the purchaser or his agent, in the presence of the seller or his agent or two witnesses (due notice having been given to the seller of the time and place of sampling), and these

samples should be taken as quickly as possible, and put into bottles or tin cases to prevent loss of moisture, and having been labelled, should be sealed by the samplers—one or more samples to be retained by the purchaser, and one to be sent to the Chemist for analysis.

FEEDING-STUFFS.

Samples of feeding-stuffs which are in the form of meal may be taken in a similar manner to that mentioned above.

Samples of cake should be taken by selecting four or more cakes from the bulk. These should be nipped to a size not larger than walnuts. The nipped cake should then be thoroughly mixed and samples of not less than one pound each taken from it. The samples should be put into bottles or tins, sealed up, and labelled. One sample should be sent to the Chemist, and one or more duplicates retained by the purchaser.

VEGETABLE PRODUCTS.

Turnips, &c., at least 50 bulbs carefully selected as of fair average growth.

Hay, straw, ensilage, &c., should be sampled from a thin section cut across the whole stack or silo, and carefully mixed; above 2 lb. weight is required for analysis.

Grain should be sampled like manures.

Grass should be representative of the whole field; about 5 lb. weight is required for analysis.

DAIRY PRODUCE.

Milk.—Samples of milk from individual cows should be taken direct from the milk-pail after complete milking. Average samples from a number of cows should be taken immediately after milking. Specify whether the sample is morning or evening milk, or a mixture of these. Samples to be tested for adulteration should not be drawn from the bottom or taken from the top of standing milk, but they should be ladled from the vessel after the milk has been thoroughly mixed. Samples of milk should be sent immediately to the Chemist.

For most purposes a half-pint bottle of milk is a large enough sample.

Butter.—About quarter-pound samples are required.

WATERS.

When the water is from a well, it should be pumped for some minutes before taking the sample.

If the well has been standing unused for a long time, it should be pumped for some hours, so that the water may be renewed as far as possible.

If the well has been newly dug or cleaned out, it should be pumped as dry as possible, daily, for a week before taking the sample.

Water from cisterns, tanks, ponds, &c., should be sampled by immersing the bottle entirely under the water, and holding it, neck

upwards, some inches below the surface. *Water from the surface should not be allowed to enter the bottle.*

Spring or stream water should not be sampled in very wet weather, but when the water is in ordinary condition. Such waters should be sampled by immersing the bottle. If not deep enough for that purpose, a perfectly clean cup should be used for transferring the water to the bottle.

When the bottle has been filled the stopper should be rinsed in the water before replacing it.

Interference with or disturbance of wells or springs, or the ground in their immediate vicinity, must be carefully avoided during sampling, and for at least twenty-four hours before it.

After a sample has been taken, it should be sent to the Chemist as speedily as possible.

A description of the source and circumstances of the water should accompany the sample, as the interpretation of the analytical results depends to some extent on a knowledge of such particulars.

N.B.—Stone jars and old wine bottles are unsuitable for conveying samples. Winchester quarts chemically cleaned should be obtained from Dr J. F. TOCHER, Crown Mansions, 41½ Union Street, Aberdeen.

COMPOSITION AND CHARACTERISTICS OF MANURES AND FEEDING-STUFFS.

Note on Statutory Statements.

In the Fertilisers and Feeding Stuffs Act, 1926, are included certain schedules which give the definitions implied on the sale of fertilisers and feeding-stuffs under certain names and also the particulars to be contained in the statutory statement which has to be furnished to the purchaser in connection with the sale of a fertiliser or a feeding-stuff. Such statutory statements "shall have effect as a written warranty by the seller that the particulars contained in the statutory statement are correct."

The particulars required vary for different articles and the under-noted are given as examples. Full particulars can be found by reference to the schedules of the Act.

FERTILISERS.

Sulphate of ammonia	Amount of nitrogen and amount of free acid.
Superphosphate	Amount of soluble phosphoric acid.
Potassium salts (potash fertilisers)	Amount of potash.
Compound fertilisers	Amounts of nitrogen, potash, soluble phosphoric acid, and insoluble phosphoric acid, if any, respectively.

FEEDING-STUFFS.

Linseed cakes and the meals of such cakes.	Amounts of oil and albuminoids.
Cotton cakes or meals (not decorticated).	Amounts of oil and albuminoids.
Cotton cakes or meals from decorticated or partly decorticated cotton seed.	Amounts of oil, albuminoids, and fibre.
Compound cakes or meals.	Amounts, if any, of oil, albuminoids, and fibre.

PRICES OF FERTILISERS AND FEEDING-STUFFS— SEASON 1943.

(Cash Prices as at 3rd February. These prices are subject to variation from month to month or oftener.)

FERTILISERS.

Name of Fertiliser.	Guarantee.	Price per Ton.	Price per Unit.
Superphosphate	16% Sol. Phos. Acid =39.3% Tric. Phos.	£ s. d. 4 19 0	s. d. 5 6
Sulphate of Ammonia (neutral)*	20.6% Nitrogen	10 0 6	9 8½
" " (March-June)	" "	10 2 0	9 9½
Basic Slag *†	12% Total Phos. Acid =26.2% Tric. Phos.	2 12 6	4 4½
" " *†	13% Total Phos. Acid =28.4% Tric. Phos.	2 15 6	4 3½
" " *†	14% Total Phos. Acid =30.6% Tric. Phos.	2 18 6	4 2½
" " *† (Bessemer)	18.3% Total Phos. Acid. =40% Tric. Phos.	3 12 6	3 11½
Bone Meal (Indian)	4% Nit. 20% Total Phos. Acid =48.7% Tric. Phos.	18 10 0	N 80 0 TPA 7 6
Chilean Nitrate of Soda *	16% Nitrogen	10 14 0	18 4½
Chilean Potash Nitrate *	15% " "	15 15 0	N 14 0 P 7 0
Nitro Chalk *	15% Potash	9 14 0	12 6½
Sulphate of Potash	15% Nitrogen	18 15 0	7 8½
Muriate of Potash	48.5% Potash 80% "	19 13 0	4 6½

The prices for all fertilisers are cash prices for two-ton lots in bags at Leith or Glasgow, unless otherwise stated. Where prices are quoted carriage paid, there is a reduction, in certain cases, of from 5/- to 10/- per ton when lifted Ex Sellers' stores.

* Carriage paid to any railway station in six-ton lots. Four-ton lots 1/- more per ton.

† The fineness is such that 80 % of the powder will pass through the prescribed sieve. 1/- more per ton if solubility guaranteed.

‡ The fineness is such that 90 % of the powder will pass through the prescribed sieve. 85 % solubility in citric acid.

N.B.—When these units are multiplied by the percentages in the analysis of a Manure, they will produce a value representing very nearly the cash price per ton at which Fertilisers may be bought in fine sutable condition at Leith or Glasgow.

Ground Lime, in bags (65 % calcium oxide), at Dufftown, 56/- per ton; (60 % calcium oxide), at Grange, 56/6 per ton; (60 % calcium oxide), at Fushiebridge, 50/7 per ton.

English Ground Lime (80 % calcium oxide), to Aberdeen, 65/7 per ton; (90 % calcium oxide), to Aberdeen, 58/8 per ton.

English Ground Lime (95 % calcium oxide), at Buxton, f.o.r. 39/9 per ton, in bags; or to Edinburgh, 64/10 per ton; to Lanark, 64/4 per ton; to Stirling, 69/9 per ton; to Dumfries, 61/11 per ton.

FEEDING-STUFFS.

Name of Feeding-Stuff.	Price per Ton.
Linseed Cake (Home), 8% Oil, 28% Albuminoids	£ s. d.
(Expeller), 9% Oil, 30% Albuminoids*	11 5 0
Cotton Seed Cake (Egyptian) (uncorticated) (home made), 4.5% Oil, 22% Albuminoids	11 7 6
Decorticated Cotton Seed Cake, 43-50% Oil and Albuminoids*	7 17 6
Ground Nut Cake—	10 2 6
Decorticated (Expeller), 43-50% Oil and Albuminoids*	9 10 0
" 57-60% Oil and Albuminoids*	9 17 6
Rice Bran Meal*	8 5 0
White Bran, straight run	9 17 6
Red Bran, straight run	8 17 6
Dried Grains †	7 7 6
Locust Beans (Kibbled)*†	8 17 6
Maize*†	9 12 6
(Flaked)*†	10 0 0
Home Oats (Feeding)	11 17 6
White Fish Meal, 4% Oil, 64% Albuminoids (at Aberdeen)	15 0 0
	23 14 8

Prices are for one-ton lots direct ex import quay or mill, unless otherwise stated.

* Controlled price. None available at this date.

† Including Bags.

‡ Bags extra.

CLASSIFICATION OF MANURES.

BONE MEALS	{	Genuine Bone Meal contains about 20 per cent Phosphoric Acid equal to 43.7 per cent Tricalcium Phosphate, and about 4 per cent Nitrogen. If Phosphates are low, Nitrogen will be high, and conversely.
MIXTURES AND COMPOUND MANURES	{	To be valued according to the following units: Nitrogen, 9/10; Soluble Phosphoric Acid, 5/9½; Insoluble Phosphoric Acid, 3/5; and Potash, 4/11 (from muriate). The value so arrived at will be the value at Leith or Glasgow, exclusive of the cost of mixing, bags and bagging, which may be taken on an average at about 30/- per ton.

INSTRUCTIONS FOR VALUING MANURES.

The unit used for the valuation of manures is the hundredth part of a ton, and as the results of analyses of manures are expressed in parts per hundred, the percentage of any ingredient of a manure when multiplied by the price of the unit of that ingredient represents the value of the quantity of it contained in a ton.

As an example take muriate of potash; a good sample (see p. 44) will be guaranteed to contain 60 per cent of oxide of potash. All potash manures are valued according to the amount of potash (oxide of potash) they yield, and muriate of potash yields 60 per cent of potash (K_2O)—i.e., 60 units per ton; and as a ton of muriate of potash costs £13, 13s., the price of the unit is the sixtieth part of that—viz., $4/6\frac{1}{2}$. If on analysis a sample of muriate of potash guaranteed to contain 60 per cent of potash is found to contain only 56 per cent, the price per ton will be $18/2$ (four times $4/6\frac{1}{2}$) less—viz., £12, 14s. 10d.

Similarly with all other manures, the price per unit is derived from the price per ton of a sample of good material up to its guarantee, and

therefore the proper price per ton of a manure is found by multiplying the price of the unit of the valuable ingredient by the percentage as found by analysis. If a manure contains more than one valuable ingredient, the unit value of each ingredient is multiplied by its percentage, and the values so found when added together give approximately the price per ton of the manure.

The commercial values of manures are determined by means of the UNITS in the following manner:—

Take the results of analysis of the manure, and look for the following substances:—

Phosphates dissolved (or soluble phosphoric acid)	
Phosphates undissolved (or insoluble phosphoric acid)	No other items but these are to be valued.
Total phosphoric acid	
Nitrogen	
Potash	

Should the results of analysis or the guarantee not be expressed in that way, the chemist or the seller should be asked to state the quantities in these terms.

Suppose the manure is a superphosphate. The price per unit of phosphoric acid in superphosphate (18 per cent grade) is 5/6, and if a consignment contains 17 per cent soluble phosphoric acid it is valued thus—

Soluble phosphoric acid. 17 times 5/6, equal to £4, 13s. 6d.

Insoluble phosphoric acid is not valued in a superphosphate.

Suppose the manure is a compound fertiliser containing 6 per cent nitrogen, 8 per cent soluble phosphoric acid, 1 per cent insoluble phosphoric acid, and 5 per cent potash. From the units given on p. 45 for "Mixtures and Compound Manures," the value of this compound fertiliser is obtained as follows:—

The value of the—

Nitrogen will be	£2	19	0	per ton
Soluble phosphoric acid will be	2	6	4	"
Insoluble phosphoric acid will be	0	3	5	"
Potash will be	1	4	7	"

£6 13 4

The value of this manure will thus be £6, 13s. 4d. per ton, exclusive of the cost of mixing, bags and bagging, which may be taken on an average at about 30/- per ton. It will be seen that the potash is valued on the assumption that it is derived from muriate.

Note.—The units have reference solely to the MARKET PRICES of MANURES, and not to their AGRICULTURAL VALUES.

TABLE OF COMPENSATION VALUES FOR 1943.

TABLE SHOWING THE VALUE OF FEEDING-STUFFS AS MANURE PER TON, AND THE COMPENSATION VALUE PER TON OF FOOD CONSUMED, BASED ON THE AVERAGE UNIT PRICES OF FERTILISERS FOR 1943.

The following is a Table showing (under Section A) the average proportions of nitrogen, phosphoric acid, and potash present in the feeding-stuffs named. The Table also shows the value per unit of nitrogen, phosphoric acid, and potash, the prices per unit being the value per unit for compound manures prevailing for 1943. Under Section B of the Table is shown the compensation value per ton of food consumed for each of the feeding-stuffs named, based on the unit prices for 1943. Column (1) of Section B of the Table shows the value per ton recovered in dung; while the remaining two columns show the residual values per ton after one crop and two crops have been removed.

The residual value, after one crop has been removed, is taken as one-half of the original residual value. Residual values, after one crop has been removed, are reduced by one-half after each crop.

Foods.	Nitrogen.		
	Per cent in food.	Value at 9s. 10d. per unit.	Two-fifths value to manure.
	(1)	(2)	(3)
		s. d.	s. d.
Cotton-cake, decorticated	6.90	67 10	27 2
Cotton-cake, undecorticated	3.54	34 10	13 11
Linseed-cake	4.75	46 9	18 8
Linseed	3.60	35 5	14 2
Soya-bean cake	6.85	67 4	26 11
Palm-nut cake	2.50	24 7	9 10
Cocoa-nut cake	3.40	33 5	13 4
Earth-nut cake	7.62	74 11	30 0
Rape cake	4.90	48 2	19 3
Beans	4.00	39 4	15 9
Peas	3.60	35 5	14 2
Wheat	1.80	17 8	7 1
Barley	1.65	16 3	6 6
Oats	2.00	19 8	7 10
Maize	1.70	16 9	6 8
Rice-meal	1.90	18 8	7 6
Locust beans	1.20	11 10	4 9
Malt	1.70	16 9	6 8
Malt culms	3.90	38 4	15 4
Bran	2.50	24 7	9 10
Brewers' and distillers' grains (dried)	3.80	32 5	13 0
Brewers' and distillers' grains (wet)	0.81	8 0	3 2
Dried distillery dreg	5.31	52 3	20 11
Clover hay	2.24	22 0	8 10
Meadow hay	1.50	14 9	5 11
Wheat straw	0.45	4 5	1 9
Barley straw	0.40	3 11	1 7
Oat straw	0.50	4 11	2 0
Mangolds	0.22	2 2	0 10
Swedes	0.25	2 6	1 0
Turnips	0.18	1 9	0 8
Fish-meal	8.98	88 4	35 4

The figures in column (10) are the

A.						B.		
VALUE PER TON AS MANURE.						COMPENSATION VALUE PER TON OF FOOD CONSUMED.		
Phosphoric Acid.			Potash.			(1) Value re- covered in dung.	Residual Value after	
Per cent in food.	Value at 5s. 9d. per unit.	Three- fourths value to manure.	Per cent in food.	Value at 4s. 11d. per unit.	Three- fourths value to manure.		(2) One crop.	(3) Two crops.
(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	s. d.	s. d.		s. d.	s. d.	s. d.	s. d.	s. d.
3.10	17 10	13 5	2.00	9 10	7 5	48 0	24 0	12 0
2.00	11 6	8 8	2.00	9 10	7 5	30 0	15 0	7 6
2.00	11 6	8 8	1.40	6 11	5 2	32 6	16 3	8 2
1.54	8 10	6 8	1.37	6 9	5 1	25 11	13 0	6 6
1.30	7 6	5 8	2.20	10 10	8 2	40 9	20 5	10 2
1.20	6 11	5 2	0.50	2 6	1 11	16 11	8 6	4 3
1.40	8 1	6 1	2.00	9 10	7 5	26 10	13 5	6 9
2.00	11 6	8 8	1.50	7 5	5 7	44 3	22 2	11 1
2.50	14 5	10 10	1.50	7 5	5 7	35 8	17 10	8 11
1.10	6 4	4 9	1.30	6 5	4 10	25 4	12 8	6 4
0.85	4 11	3 8	0.96	4 9	3 7	21 5	10 9	5 4
0.85	4 11	3 8	0.53	2 7	1 11	12 8	6 4	3 2
0.75	4 4	3 3	0.55	2 8	2 0	11 9	5 11	2 11
0.60	3 5	2 7	0.50	2 6	1 11	12 4	6 2	3 1
0.60	3 5	2 7	0.37	1 10	1 5	10 8	5 4	2 8
0.60	3 5	2 7	0.37	1 10	1 5	11 6	5 9	2 11
0.80	4 7	3 5	0.80	3 11	2 11	11 1	5 7	2 9
0.80	4 7	3 5	0.60	2 11	2 2	12 3	6 2	3 1
2.00	11 6	8 8	2.00	9 10	7 5	31 5	15 9	7 10
2.70	15 8	11 8	1.45	7 2	5 5	26 11	13 6	6 9
1.61	9 3	6 11	0.20	1 0	0 9	20 8	10 4	5 2
0.42	2 5	1 10	0.05	0 3	0 2	5 2	2 7	1 4
0.44	2 6	1 11	0.22	1 1	0 10	23 8	11 10	5 11
0.57	3 3	2 5	1.50	7 5	5 7	16 10	8 5	4 3
0.40	2 4	1 9	1.60	7 10	5 11	13 7	6 10	3 5
0.24	1 5	1 1	0.80	3 11	2 11	5 9	2 11	1 5
0.18	1 0	0 9	1.00	4 11	3 8	6 0	3 0	1 6
0.24	1 5	1 1	1.00	4 11	3 8	6 9	3 5	1 8
0.07	0 5	0 4	0.40	2 0	1 6	2 8	1 4	0 8
0.06	0 4	0 3	0.22	1 1	0 10	2 1	1 1	0 6
0.05	0 3	0 2	0.30	1 6	1 2	2 0	1 0	0 6
7.24	41 8	31 3	0.50	2 6	1 11	68 6	34 3	17 2

sum of columns (3), (6), and (9).

BOTANICAL DEPARTMENT

Consulting Botanist to the Society—(vacant).

The Society has fixed the following scale of charges for the examination of plants and seeds for the *bona fide* and individual use and information of members of the Society (not being seedsmen), who are particularly requested, when applying to the Consulting Botanist, to mention the kind of examination required, and to quote its number as appearing in the under noted Scale of Charges. The charge for examination must be paid at the time of application, and the carriage or postage on all parcels must be prepaid.

Scale of Charges for Examinations.

1. A report on the purity, amount, and nature of foreign materials, and the germinating power of a sample of seed 1s.
2. Determination of the species of any weed or other plant, or of any vegetable parasite, with a report on its habits and the means for its extermination or prevention 1s.
3. Report on any disease affecting farm crops 1s.
4. Determination of the species of any natural grass or fodder plant, with a report on its habits and pasture or feeding value 1s.

The Consulting Botanist's Reports are furnished to enable members—purchasers of seeds and corn for agricultural or horticultural purposes—to test the value of what they buy, and are not to be used or made available for advertising or trade purposes by seedsmen or otherwise.

Purchase of Seeds.

The purchaser should obtain from the vendor, by invoice or other writing, the proper designation of the seeds bought, with a guarantee of the percentage of purity and germination, and of its freedom from ergot, and in the case of clover, from the seeds of dodder or broomrape.

It is strongly recommended that the purchase of *prepared mixtures* of seeds should be avoided. The different seeds should be purchased separately and mixed by the farmer: mixtures cannot be tested for germination.

The Sampling of Seeds.

The utmost care should be taken to secure a fair and honest sample. This should be drawn from the bulk delivered to the purchaser, and not from the sample sent by the vendor.

When legal evidence is required, the sample should be taken from the bulk, and placed in a sealed bag in the presence of a witness. Care should be taken that the sample and bulk be not tampered with after delivery, or mixed or brought in contact with any other sample or bulk.

At least one ounce of grass and other small seeds should be sent, and two ounces of cereals and the larger seeds. When the bulk is obviously impure the sample should be at least double the amount specified. Grass seeds should be sent at least four weeks, and seeds of clover and cereals two weeks, before they are to be used.

The exact name under which the sample has been sold and purchased should accompany it.

Reporting the Results.

The Report will be made on a schedule in which the nature and amount of impurities will be stated, and the number of days each sample has been under test, with the percentage of the seeds which have germinated.

"Hard" clover seeds, though not germinating within the time stated, will be considered good seeds, and their percentage separately stated.

The impurities in the sample, including the chaff of the species tested, will be specified in the schedule, and only the percentage of the pure seed of that species will be reported upon; but the REAL VALUE of the sample will be stated. The Real Value is the combined percentages of purity and germination, and is obtained by multiplying these percentages and dividing by 100: thus in a sample of Meadow Fescue having 88 per cent purity and 95 per cent germination, 88 multiplied by 95 gives 8360, and this divided by 100 gives 83·6, the Real Value.

Selecting Specimens of Plants.

The whole plant should be taken up and the earth shaken from the roots. If possible the plants should be in flower or fruit. They must be packed in a light box, or in a firm paper parcel.

Specimens of diseased plants or of parasites should be forwarded as fresh as possible. They must be placed in a bottle, or packed in tinfoil or oil-silk.

All specimens should be accompanied with a letter specifying the nature of the information required, and stating any local circumstances (soil, situation, &c.) which, in the opinion of the sender, would be likely to throw light on the inquiry.

NOTE.—Members are reminded that Seeds may now be tested at the Department of Agriculture for Scotland Seed-testing Station. Samples should be addressed to T. Anderson, Esq., Seed-testing Station, East Craigs, Corstorphine, Edinburgh.

PREMIUMS OFFERED

1943

GROUP I.—REPORTS.

GENERAL REGULATIONS.

1. It is to be distinctly understood that the Society is not responsible for the views, statements, or opinions of any of the writers whose papers are published in the 'Transactions.'

2. All reports must be legibly written; and on one side of the paper only; they must specify the number and subject of the Premium for which they are in competition; they must bear a distinguishing motto, and be accompanied by a sealed letter, similarly marked, containing the name and address of the reporter—initials must not be used.

3. No sealed letter, unless belonging to a report found entitled to the Premium offered, or a portion of it, will be opened without the author's consent.

4. Reports for which a Premium, or a portion of a Premium, has been awarded, become the property of the Society, and cannot be published in whole or in part, or circulated in any manner, without the consent of the Directors. All other papers will be returned to the authors if applied for within twelve months.

5. The Society is not bound to award the whole or any part of a Premium.

6. All reports must be of a practical character, containing the results of the writer's own observation or experiment, and the special conditions attached to each Premium must be strictly fulfilled. General essays, and papers compiled from books, will not be rewarded or accepted. Weights and measurements must be indicated by the imperial standards.

7. The Directors, before or after awarding a Premium, shall have power to require the writer of any report to verify the statements made in it.

8. The decisions of the Board of Directors are final and conclusive as to all matters relating to Premiums, whether for Reports or at General or District Shows; and it shall not be competent to raise any question or appeal touching such decisions before any other tribunal.

9. The Directors will welcome papers from any Contributor on any suitable subject, whether included in the Premium List or not; and if the topic and the treatment of it are both approved, the writer may be remunerated and his paper published.

SECTION 1.—THE SCIENCE AND PRACTICE OF AGRICULTURE.

FOR APPROVED REPORTS.

1. On any useful practice in Rural Economy adopted in other countries, and susceptible of being introduced with advantage into Scotland—The Gold Medal. To be lodged by 1st November in any year.

The purpose chiefly contemplated by the offer of this premium is to induce travellers to notice and record such particular practices as may seem calculated to benefit Scotland. The Report to be founded on personal observation.

2. Approved Reports on other suitable subjects. To be lodged by 1st November in any year.

SECTION 2.—ESTATE IMPROVEMENTS.

FOR APPROVED REPORTS.

1. By the Proprietor in Scotland who shall have executed the most judicious, successful, and extensive Improvement—The Gold Medal, or Ten Pounds. To be lodged by 1st November in any year.

Should the successful Report be written for the Proprietor by his resident factor or farm manager, a Minor Gold Medal will be awarded to the writer in addition to the Gold Medal to the Proprietor.

The merits of the Report will not be determined so much by the mere extent of the improvements, as by their character and relation to the size of the property. The improvements may comprise reclaiming, draining, enclosing, planting, road-making, building, and all other operations proper to landed estates. The period within which the operations may have been conducted is not limited, except that it must not exceed the term of the Reporter's proprietorship.

2. By the Proprietor or Tenant in Scotland who shall have reclaimed within the ten preceding years not less than forty

acres of Waste Land—The Gold Medal, or Ten Pounds. To be lodged by 1st November in any year.

3. By the Tenant in Scotland who shall have reclaimed within the ten preceding years not less than twenty acres of Waste Land—The Gold Medal, or Ten Pounds. To be lodged by 1st November in any year.

4. By the Tenant in Scotland who shall have reclaimed not less than ten acres within a similar period—The Medium Gold Medal, or Five Pounds. To be lodged by 1st November in any year.

The Reports in competition for Nos. 2, 3, and 4 may comprehend such general observations on the improvement of waste lands as the writer's experience may lead him to make, but must refer especially to the lands reclaimed—to the nature of the soil—the previous state and probable value of the subject—the obstacles opposed to its improvement—the details of the various operations—the mode of cultivation adopted—and the produce and value of the crops produced. As the required extent cannot be made up of different patches of land, the improvement must have relation to one subject; it must be of profitable character, and a rotation of crops must have been concluded before the date of the Report. *A detailed statement of the expenditure and return* and a certified measurement of the ground are requisite.

5. By the Proprietor or Tenant in Scotland who shall have improved within the ten preceding years the Pasturage of not less than thirty acres, by means of top-dressing, draining, or otherwise, without tillage, in situations where tillage may be inexpedient—The Gold Medal, or Ten pounds. To be lodged by 1st November in any year.

6. By the Tenant in Scotland who shall have improved not less than ten acres within a similar period—The Minor Gold Medal. To be lodged by 1st November in any year.

Reports in competition for Nos. 5 and 6 must state the particular mode of management adopted, the substances applied, the elevation and nature of the soil, its previous natural products, and the changes produced.

SECTION 3.—HIGHLAND INDUSTRIES.

FOR APPROVED REPORTS.

1. The best mode of treating native Wool; cleaning, carding, dyeing, spinning, knitting, and weaving by hand in the Highlands and Islands of Scotland—Five Pounds. To be lodged by 1st November in any year.

SECTION 4.—MACHINERY.

FOR APPROVED REPORTS.

To be lodged by 1st November in any year.

SECTION 5.—FORESTRY.

FOR APPROVED REPORTS.

1. On Plantations of not less than eight years' standing formed on deep peat-bog—The Medium Gold Medal, or Five Pounds. To be lodged by 1st November in any year.

The Premium is strictly applicable to deep peat or flow moss; the condition of the moss previous to planting, as well as at the date of the Report, should, if possible, be stated.

The Report must describe the mode and extent of the drainage, and the effect it has had in subsiding the moss—the trenching, levelling, or other preliminary operations that may have been performed on the surface—the mode of planting—kinds, sizes, and number of trees planted per acre—and their relative progress and value, as compared with plantations of a similar age and description grown on other soils in the vicinity.

GROUP II.—DISTRICT GRANTS.

APPLICATIONS.

Forms of Application may be obtained from the Secretary, 8 Eglinton Crescent, Edinburgh 12, which should be completed and returned on or before **1st November 1943**, in respect of a Grant commencing in the following year.

RENEWAL OF GRANT.—Applications for **renewal** of a particular Grant will be entertained only after the lapse of a specified interval of years (as undernoted) from the termination of the previous Grant, without prejudice, however, to the competency of applying in such intermediate years for a Grant in any other class.

Class.	Interval.
*1. Grants of £12 for Show Premiums for Horses, Cattle, Sheep, and Pigs	4 years.
2. Grants of £15 in respect of Stallions engaged for Agricultural purposes	3 years.
*3. Grants of Silver Medals in aid of Premiums	2 years.
4. Special Grants	—
5. Grants of £10 to Federations of S.W.R.I. for Show or Exhibition Prizes	2 years.

* NOTE.—Grants under Classes 1 and 3 have been suspended for the duration of the War.

CLASS 1.

LOCAL AGRICULTURAL SOCIETIES—GRANTS OF £12 FOR SHOW PREMIUMS FOR HORSES, CATTLE, SHEEP, AND PIGS.

REGULATIONS.—See Volume for 1940 for Regulations and Rules of Competition.

GRANTS SUSPENDED THROUGHOUT THE WAR.—In January 1941 the Directors agreed that it was undesirable for the Society to encourage the holding of Agricultural Shows during the War, and it was decided, accordingly, that all grants by the Society of money and medals in aid of Local Agricultural Shows be suspended throughout the further duration of the War.

The Societies entitled to grants at the end of the War on resumption of their Shows are detailed in the Volume for 1941.

CLASS 2.

HORSE ASSOCIATIONS—GRANTS OF £15 IN RESPECT OF STALLIONS ENGAGED FOR AGRICULTURAL PURPOSES.

REGULATIONS, 1943.

1. The Highland and Agricultural Society will make Grants to Horse Associations and other Societies in different districts engaging Stallions for agricultural purposes. The total sum expended by the Highland and Agricultural Society in such grants shall not exceed the sum of £210 in any one year.

(*Note.*—As a special provision this sum has been raised to £300 for the year 1943.)

2. All applications must be at the instance of a Horse Association. Either the Convener or the Secretary must be a member of the Highland and Agricultural Society of Scotland.

3. *Application of Grant.*—The portion of the Grant to any one Association or Society shall not exceed the sum of £15 in any one year. It is intended that the Grant shall be used by the Association or Society for the purpose of enabling it to secure a better class of Stallion.

4. *Duration of Grant.*—The Grant will continue for three consecutive years.

5. *Registration of Stallions.*—The Grants will be available only for Stallions which, for the years to which the Grants apply, are registered in the Register of Certified Draught Stallions published by the Department of Agriculture for Scotland. (For information regarding the Registration of Stallions, apply to the Secretary of the Department of Agriculture for Scotland, St Andrew's House, Edinburgh.)

6. *Engagement of Stallions.*—In the event of a Horse not being engaged in any one year while the provisions of the Grant are in force, the Grant made by the Highland and Agricultural Society will cease.

7. *Report to be Submitted.*—Forms of Report will be furnished to the Secretaries. Full details, as required, must be given and the completed Reports, duly signed and certified, must be lodged with the Secretary of the Highland and Agricultural Society as soon as possible, and in no case later than 1st November. These Reports are subject to the approval of the Directors of the Highland and Agricultural Society, against whose decision there shall be no appeal. The grant will lapse if no Report is lodged by the due date.

8. *Payment of Grant.*—Grants will be paid in December after the Reports have been received and found to be in order and passed by the Board of Directors.

9. *Renewal of Grant.*—An Association or Society which has received a Grant shall not be eligible to apply for a renewal of the Grant until after the expiry of three years from the termination of the previous Grant. In disposing of applications the Directors of the Highland and Agricultural Society of Scotland shall keep in view the length of interval that has elapsed since making a previous Grant, giving priority to those Associations or Societies which have been longest without a Grant.

Grants in 1943.

3rd and Final Year—GRANT OF £15.

1. CLACKMANNANSHIRE UNION AGRICULTURAL SOCIETY.
Convener—Robert M'Gee, Blackfaulds, Alloa.
Secretary—G. F. Piggott, Union Street, Alloa.
 Granted 1941.
2. HOWE O' THE MEARN'S HORSE-BREEDING ASSOCIATION.
Convener—Allan Smith, Drumsleed, Fordoun.
Secretary—Rowland Reed, Solicitor, Commercial Bank Buildings, Laurencekirk.
 Granted 1941.
3. KIRRIEMUIR DISTRICT AGRICULTURAL ASSOCIATION.
Convener—Edward Weighton, Caddam, Kirriemuir.
Secretary—W. M. Wallace, National Bank of Scotland Ltd., Kirriemuir.
 Granted 1941.
4. MORAYSHIRE CLYDESDALE HORSE-BREEDING ASSOCIATION.
Convener—Stephen Taylor, Kirkhill, Alves, Morayshire.
Secretary—A. J. Morrison, C.E., 87 High Street, Elgin.
 Granted 1941.

2nd Year—GRANT of £15.

5. BIGGAR AND PEEBLES CLYDESDALE HORSE - BREEDING ASSOCIATION.
Convener—James A. Brown, Cormiston Towers Farm, Biggar, Lanarkshire.
Secretary—James Noble, Gowanlea, Symington, Biggar, Lanarkshire.
 Granted 1942.
6. MID ARGYLL AGRICULTURAL SOCIETY.
Convener—R. A. Cadzow, Ormsary, Lochgilphead, Argyll.
Secretary—Major J. G. Mathieson, Ri-Cruin, Kilmartin, Lochgilphead, Argyll.
 Granted 1942.

7. SANDAY AGRICULTURAL ASSOCIATION.

Convener—James Irvine, West Brough, Sanday, Orkney.*Secretary*—John Thomson, Ortie, Sanday, Orkney.

Granted 1940. (Grants in abeyance 1940 and 1942.)

1st Year—GRANT of £15.

8. BRECHIN AND DISTRICT HORSE-BREEDING SOCIETY.

Convener—Andrew N. Guild, Grosefield, Brechin.*Secretary*—Frederick A. Ferguson, Solicitor, Brechin.

Granted 1943.

9. DUMFRIES AND DISTRICT HORSE-BREEDING ASSOCIATION.

Convener—R. Dalziel, Rue, Auldgirth.*Secretary*—William J. Will, B.Sc., &c., Acrehead, Dumfries.

Granted 1943.

10. DUNBLANE, DOUNE, AND CALLANDER HORSE-BREEDING SOCIETY.

Convener—R. W. Fairweather, Estates Office, Blair Drummond, by Stirling.*Secretary*—G. Kerr Petrie, Mansfield, Doune.

Granted 1943.

11. ROSS OF MULL HEAVY HORSE-BREEDING SOCIETY.

Convener—.....*Secretary*—W. R. MacDougall, Uisgean, Bunessan, Isle of Mull.

Granted 1943.

12. SLAMANNAN DISTRICT AGRICULTURAL SOCIETY.

Convener—Gavin Steel, Viewhill, Slamannan.*Secretary*—Angus A. M'Lean, Duart, Slamannan.

Granted 1943.

CLASS 3.

LOCAL AGRICULTURAL SOCIETIES—GRANTS OF SILVER MEDALS IN AID OF PREMIUMS.

REGULATIONS.—See Volume for 1940 for Regulations and Rules of Competition.

GRANTS SUSPENDED THROUGHOUT THE WAR.—In January 1941 the Directors agreed that it was undesirable for the Society to encourage the holding of Agricultural Shows during the War, and it was decided, accordingly, that all grants by the Society of money and medals in aid of Local Agricultural Shows be suspended throughout the further duration of the War.

The Societies entitled to grants at the end of the War on resumption of their Shows are detailed in the Volume for 1941.

CLASS 4.

SPECIAL GRANTS—1943.

(1) ANNUAL.

1. NORTHERN COUNTIES ARTS AND CRAFTS SOCIETY—£20.
Convener—Miss Mackintosh of Raigmore, Raigmore,
 Inverness.
Joint-Secretary—Mrs Mitford, Berryfield, Lentrane, Inverness.
 Granted 1922.
2. SCOTTISH NATIONAL UNION OF ALLOTMENT HOLDERS.
 £15 and 15 Medium Silver Medals to be offered as Prizes
 for best Allotments.
Secretary and Treasurer—Miss H. Thompson, 28 Stafford
 Street, Edinburgh.
 Granted 1927.

GRANTS SUSPENDED.

Various grants have been suspended for the further duration of the War (see reference under Class 1). The Societies, &c., entitled to grants at the end of the War, on resumption of their Shows or Competitions, are detailed in the Volume for 1941.

CLASS 5.

FEDERATIONS OF SCOTTISH WOMEN'S RURAL
INSTITUTES—GRANTS OF £10.

REGULATIONS, 1943.

1. The Highland and Agricultural Society of Scotland will provide annually a sum not exceeding £150 as special Grants to Federations of Scottish Women's Rural Institutes.
2. *Grant to Federation, £10.*—The amount of the Grant to any one Federation shall not exceed the sum of £10 per annum.
3. *Duration of Grant.*—The Grant will continue for two consecutive years.
4. *Disposal of Applications.*—In disposing of applications for Grants, the Directors of the Highland and Agricultural Society shall keep in view the length of interval that has elapsed since the expiration of the last Grant, giving priority to those Federations which have been longest off the list.

5. *Eligibility to Apply*.—All applications must be at the instance of a properly constituted Federation of Institutes.

6. *Application of Grant*.—The Grant of £10 shall not be applied as a Grant-in-aid to the general funds of a Federation, but must be offered in the form of Prizes at any Show or Competition held under the auspices of the Federation.

7. *Announcement of Grant*.—The offer of Prizes must be announced in the Prize List or Catalogue of the Show or Competition as "presented by the Highland and Agricultural Society of Scotland," or the amount of the Grant must be shown as a separate item of donation in the published statement of Accounts.

8. *Rules of Competition*.—The Rules of Competition for the Prizes, the funds for which are derived from Grants of the Highland and Agricultural Society of Scotland, shall be such as are generally enforced in the case of Prizes offered from the Federation's own funds.

9. *Report to be Submitted*.—Forms of Report will be furnished to the Secretaries of Federations, and these must be completed and returned to the Society as soon as possible after the Show or Competition and in no case later than 1st November. These Reports are subject to the approval of the Directors of the Highland and Agricultural Society, against whose decision there shall be no appeal. All Reports must be signed and certified as marked on the Form.

The Grant will lapse if no Report is lodged.

10. *Payment of Grant*.—Payment of the Grant will be made in December after the Reports of the Awards have been received and found to be in order and passed by the Board of Directors.

11. *Renewal of Grant*.—A Federation which has received a Grant for two consecutive years shall not be eligible to apply for a renewal of the Grant until after the expiry of two years from the termination of the previous Grant.

Grants in 1943.

2nd Year.

1. BUTE, ISLE OF, FEDERATION.

Convener—Miss M'Farlane, Meikle Kilchattan, Kingarth, Rothesay.

Secretary—Miss M. Gray Buchanan, St Margaret's, Ascog, Rothesay.

Granted 1940. (Grants in abeyance 1940, 1941.)

2. DUMFRIESSHIRE FEDERATION.

Convener—Mrs Graham, Mossknowe, Kirkpatrick-Fleming.

Secretary—Mrs Forrester, Kilness, Dumfries.

Granted 1939. (Grants in abeyance 1940, 1941, 1942.)

3. EAST LOTHIAN FEDERATION.

Convener—Mrs Hay, Belton, Dunbar.

Secretary—Mrs M'Kemmie, 2 Wemyss Place, Haddington.

Granted 1938. (Grants in abeyance 1938, 1940, 1941, 1942.)

4. MIDLOTHIAN FEDERATION.

Convener—Mrs Mercer, Southfield, Dalkeith.*Secretary*—Miss N. Scott Muir, 10 Silverknowes Loan,
Davidson's Mains, Edinburgh 4.

Granted 1940. (Grants in abeyance 1940, 1941.)

5. MULL, ISLE OF, FEDERATION.

Convener—Mrs Allan of Aros, Tobermory.*Secretary*—Mrs Cuninghame, Linnthu, Tobermory.

Granted 1939. (Grants in abeyance 1940, 1941, 1942.)

6. ROSS-SHIRE FEDERATION.

Convener—Mrs Ross, East House, Portmahomack, Ross-shire.*Secretary*—Miss Margaret Rose, Inchrorie, Strathpeffer.

Granted 1939. (Grants in abeyance 1940, 1941, 1942.)

7. STEWARTY OF KIRKCUDBRIGHT FEDERATION.

Convener—Mrs Jaffe, Netherhall, Castle-Douglas.*Secretary*—Miss A. R. Parker, Balmakethe, Castle-Douglas.

Granted 1940. (Grant in abeyance 1940, 1942.)

GROUP III.—COTTAGES AND GARDENS, &c.

CLASS 6.

**LOCAL SOCIETIES, &c.—GRANTS FOR BEST-KEPT
COTTAGES AND GARDENS.**

CLASS 7.

**LOCAL SOCIETIES, &c.—GRANTS OF MINOR SILVER
MEDALS FOR BEST-KEPT COTTAGES AND GARDENS,
GARDEN PRODUCE, POULTRY, AND HONEY.**

REGULATIONS.—See Volume for 1941 for Regulations and Rules of Competition.

GRANTS.—None of the Societies listed in 1941 held a Competition in that year. In the event of any Society holding a Competition in 1943, the respective grants will be made available, as detailed in the Volume for 1941.

GROUP IV.—PLOUGHING, HOEING, AND LONG FARM SERVICE.

1. MEDALS FOR PLOUGHING COMPETITIONS.

The Ploughing Medal will be given to the winner of the first Premium at Ploughing Competitions, provided a Report in the following terms on the official form is made to the Secretary, within one month of the Competition, by a Member of the Society. Forms of Report to be had on application.

FORM OF REPORT.

I, _____ of _____, Member of the Highland and Agricultural Society, hereby certify that I attended the Ploughing Match of the _____ Association at _____ in the county of _____ on the _____ when _____ ploughs competed; _____ of land were assigned to each, and _____ hours were allowed for the execution of the work. The sum of £ _____ was awarded as follows:—

[Here enumerate the names and designations of successful Competitors.]

RULES OF COMPETITION.

1. All Matches must be at the instance of a Local Society or Ploughing Association, and no Match at the instance of an individual, or confined to the tenants of one estate, will be recognised.

2. The title of such Society or Association, together with the name and address of its Secretary, must be registered with the Secretary of the Highland and Agricultural Society of Scotland, 8 Eglinton Crescent, Edinburgh.

3. Not more than one Match in the same season can take place within the bounds of the same Society or Association.

4. All reports must be lodged within one month of the date of the Match, and certified by a Member of the Highland and Agricultural Society who was present at it.

5. A Member can report only one Match; and a Ploughman cannot carry more than three Medals in the same season.

6. To warrant the grant of the Medal, there must have been 12 Ploughs in actual competition for the medal (*i.e., in the particular class for which the medal was offered*) and not less than £3 awarded in Prizes by the Local Society. The Medal to be given to the winner of the first prize.

7. The Local Society or Ploughing Association shall decide what class of ploughs shall compete for the Medal, and if so agreed, may offer it for competition to the class of plough most generally in use in the district.

8. The Local Society or Committee may, if they desire, arrange to let each Ploughman have one person to guide the horses for the first two and the last two furrows, but in no case shall Ploughmen receive any other assistance, and their work must not be set up or touched by others. Attention should be given to the firmness and sufficiency of the work below, more than to its neatness above the surface.

9. The Local Committee is required to fix the time to be allowed for ploughing the portion of land, and they are recommended that the time be at the rate of not more than fourteen hours per imperial acre on light land, and eighteen hours on heavy or stony land.

NOTE.—The attention of the Directors of the Society has frequently been drawn to certain irregularities which have occurred in connection with the conduct of Ploughing Matches and the completion of the Reports thereon. Complaints have been made (a) that the allotted amount of ground has not been ploughed, within the specified time, by the competitor awarded the first prize; (b) that the Report sent to this Society has been signed by a Member of the Society who was not present at the Match. It has to be pointed out that any infringement of the above Rules by a Local Society or Ploughing Association will render that Society or Association liable, at the discretion of the Board of Directors, to be debarred from receiving the Society's Medals.

2. MEDALS FOR HOEING COMPETITIONS.

The Minor Silver Medal will be given to the winner of the first Premium at Hoeing Competitions, provided a Report on the official form is made to the Secretary within a month of the Competition by a Member of the Society. Forms of Report to be had on application.

RULES OF COMPETITION.

1. All Matches must be at the instance of a Local Society or Hoeing Association, and no Match at the instance of an individual, or confined to the tenants of one estate, will be recognised.

2. The title of such Society or Association, together with the name and address of its Secretary, must be registered with the Secretary of the Highland and Agricultural Society of Scotland, 8 Eglinton Crescent, Edinburgh.

3. Not more than one Match in the same season can take place within the bounds of the same Society or Association.

4. All reports must be lodged within one month of the date of the Match, and certified by a Member of the Highland and Agricultural Society who was present at it.

5. A Member can only report one Match; and same Competitor cannot carry more than three Medals in the same season.

6. To warrant the grant of the Medal there must have been twelve hoes in Competition, and not less than Three Pounds awarded in prizes by the Local Society or Association. The Medal to be given to the winner of the first prize.

7. The time to be allowed to be decided by the local Committee, but in no case to exceed two hours for two drills of 100 yards each, the third drill being unoccupied, so that Competitors do not interfere with their neighbour's work.

8. Competitors must finish their work as they go along—no turning back or after-dressing allowed. Hand-picking or transplanting shall be strictly prohibited.

9. A Committee shall be appointed to watch the work, and any Competitor found transplanting or otherwise not complying with the Rules shall have his number withdrawn, and be debarred from receiving any prize which might otherwise have been awarded to him.

NOTE.—Medals will be awarded under similar conditions for Competitions in hand-singling.

3. CERTIFICATES AND MEDALS FOR LONG FARM SERVICE.

Certificates and Silver Medals for long service will be awarded by the Society to farm servants, male or female, having an approved service in Scotland of not less than thirty years (not necessarily continuous) —(a) with one employer on the same or different holdings; (b) on the same holding with different employers.

Special Certificates and Gold Medals are also awarded to farm servants, male or female, having an approved service in Scotland of not less than forty-five years (not necessarily continuous), on similar conditions of employment as the above. (*Note*.—The issue of Gold Medals has been temporarily suspended for the further duration of the War.)

Forms of Application are obtainable from the Secretary, 8 Eglinton Crescent, Edinburgh.

War Service to count towards the time required for qualification, where farm servants have returned to same service or employment with same farmer or his family.

The award is strictly confined to **Farm** workers, such as Ploughmen, Cattlemen, and Shepherds.

Domestic and House Servants and Estate workers, such as Foresters, Carters, Grooms, &c., are not eligible.

Awards in 1942.

The following received the Special Certificate (Gold Medal temporarily suspended) for service of forty-five years and over :—

William Farquhar, Sorbie, Ardrossan.

Andrew King, Tillycairn, Tillyfourie.

Peter M'Kinlay, Poltalloch Home Farm, Argyll.

The following received the Silver Medal and Certificate for service of from thirty to forty-four years :—

Biggar, John, Hassendean, Hawick.

Crawford, Neil, Tibertich, Kilmartin.

Crawford, Robert, Clarkswood, Minnigaff.

Crighton, David, Newtoft, Flowerdale, Kinrossie.

Crossan, Matthew, Mochrum Cottage, Maybole.

Dalgleish, William, Ferrygate, North Berwick.
Fleming, John, Arduaine, Argyll.
Forrest, Mrs Rachel, Brownrigg, North Berwick.
Forsyth, Archibald, Fettes, Killearnan.
Fraser, George, Kincaple, Guardbridge.
Galbraith, Peter, Leitholm, Coldstream.
Hiddleston, William, Kirkchrist, Kirkcudbright.
Keith, John, Dochfour Home Farm, Inverness.
Kirkpatrick, Finnian, Hunterheck, Moffat.
Laidlaw, James, Manorhill, Kelso.
Lavery, Catherine M., Barlewan, Maybole.
Leslie, John, Upper Coull, Morinsh, Glenlivet.
M'Donald, James, Cuilmore, Kinloch Rannoch.
Mackay, Thomas, Ribigill, Tongue.
M'Leod, Ewen, Carbreck, Durness.
M'Vey, Robert, Shields Farm, Prestwick.
Milne, James, Kirkton Mill, Inverkeilor.
Murray, Peter, Watermeetings, Elvanfoot.
Paterson, John, Braehead, Lugar, Cumnock.
Pattullo, John C., Mains of Auchmithie, Arbroath.
Reid, John J., Finnigill, Wamphray.
Rennie, Thomas, Drumblair, Port-William.
Robertson, William, Acharn, Morven.
Royan, James, Lochaber, Hillhead, Forres.
Sanderson, James, 83 Lochfauld Road, Lambhill, Glasgow.
Shaw, Alexander, Hillhead Farm, Forres.
Taylor, James, 10 Almond Terrace, Whitecross, Linlithgow.
Taylor, James, 205 High Street, Laurencekirk.
Wilson, John, Lightshaw, Muirkirk.

MEMBERS ADMITTED SINCE THE LIST WAS PUBLISHED IN APRIL 1941.

ARRANGED ACCORDING TO SHOW DISTRICTS.

(ELECTED 3RD JUNE 1942 AND 6TH JANUARY 1943.)

1.—GLASGOW DIVISION

ARGYLL

Admitted
1943 MacInnes, Donald, Ormaig Farm, Kilmartin, Lochgilphead

AYR

1942 Booth, Miss C. E., The Hostel, Auchincruive
1942 Shaw, Alexander, M.R.C.V.S., Pathhead, New Cumnock

BUTE

1943 M'Intyre, Donald A., Gertons, North Bute

LANARK

1943 Gardner, C. S., 1250 Gartloch Road, Stepps
1943 Wilkie, Alexander C., Birdsfield Farm, High Blantyre

RENFREW

1942 Cameron, Robert, Netherwood Farm, Kilmascolm
1943 Carmichael, Michael A., B.Sc., M.R.C.V.S., 36 Love Street, Paisley
1942 Marthur, Duncan, Elm Bank, Johnstone
1943 Turner, David C., Loanhead, Johnstone

2.—PERTH DIVISION

PERTH

1942 Fleming, Captain R. S. T., Innerhadden, Kinloch Rannoch

3.—STIRLING DIVISION

DUMBARTON

1943 Dick, John, Kipperoch Farm, Dumbarton

STIRLING

1942 Dunn, Alexander, 111 Main Street, Kilsyth
1943 Glen, R. B. Sommerville, J.P., Montrose Estates Office, Drymen
1943 Shanks, William, Beechfield, Denny

4.—EDINBURGH DIVISION

MID-LOTHIAN

1943 Aitken, Ronald A., 1 Colinton Mains Crescent
1943 Cowper, Miss R. A., Gogar Mains, Corstorphine
1943 Grant, William, F.L.F.M., Chancelot Flour Mills

WEST LOTHIAN

1942 Bowie, Andrew B., Bridgend, Linlithgow
1943 Ross, Cecil, Niddry Mains, Wincoburn

5.—ABERDEEN DIVISION**ABERDEEN**

1943 Henderson, Donald, Townhead, Kintore
 1943 Mitchell, Elijah, Drimmies, Inverurie
 1913 Mitchell, William, The Dairy, Market
 Square, Inverurie
 1942 Nicol, Major John W., of Ballogie,
 Aboyne

KINCARDINE

1943 Brown, H. G. Hargreaves, Cowie House,
 Stonehaven
 1942 Reed, Rowland, Commercial Bank
 Buildings, Laurencekirk

6.—DUMFRIES DIVISION**DUMFRIES**

1943 Sloan, James S., Hirkledale, Cummertrees, Annan

7.—INVERNESS DIVISION**MORAY**

1943 Robertson, Neil, Linkwood, Elgin

ENGLAND AND WALES

1942 Petter, Captain R. C., 3 Fairmount
 Drive, Loughborough
 1943 Scott-Fisher, C. D., Co-operative Whole-
 sale Society Ltd, 1 Balloon Street,
 Manchester

1943 Wilson, John L., B.Sc., 1 Pandy Road,
 Aberkenfig, Glamorgan

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HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND

FOUNDED 1784

Privileges of Members

MEMBERS OF THE SOCIETY ARE ENTITLED—

1. To receive a free copy of the 'Transactions' annually.
2. To apply for District Premiums that may be offered, and for Long Service Awards for Agricultural Employees.
3. To report Ploughing Matches for Medals that may be offered.
4. To Free Admission to the Shows of the Society.
5. To reduced rates for exhibits in the Society's Shows.*
6. To have Manures and Feeding-Stuffs analysed at reduced fees.
7. To have Insect Pests and Diseases affecting Farm Crops inquired into.
8. To Attend and Vote at General Meetings of the Society.
9. To Vote for the Election of Directors, &c., &c.

Analysis of Manures and Feeding-Stuffs

This scale of fees applies only to Members whose subscriptions are not in arrears.

The Fees of the Society's Chemist for Analysis made for Members of the Society shall, until further notice, be as follows:—

- (1) The determination of one ingredient in a single sample of a *manure* or of a *feeding-stuff* 3s. 6d.
- (2) The determination of two ingredients in a single sample of a *manure* or of a *feeding-stuff* 5s.
- (3) The complete analysis of a sample of a *manure* or of a *feeding-stuff* 10s.

These charges apply only to analyses made for agricultural purposes, and for the sole and private use of Members of the Highland and Agricultural Society who are not engaged in the manufacture or sale of the substances analysed.

If the sample represents a substance bought under a guarantee, and, if it is found to be notably deficient, the Consulting Chemist will communicate with the vendor and endeavour to obtain a satisfactory settlement for the buyer.

The Society's Chemist also supplies valuations of manures, according to the Society's scale of units, in cases in which the cash price asked by the seller accompanies the sample.

Chemist.—Mr J. F. TOCHER, D.Sc., LL.D., F.I.C., Crown Mansions, 41½ Union Street, Aberdeen.

Reports on the Animal Enemies of Crop Plants and Live Stock (Including Poultry)

The Consulting Zoologist is prepared to send a Report to any Member of the Society on damage to or diseases of plants and animals due to animal agency (Insects, Mites, Worms, Snails, Slugs, Birds, and the Smaller Mammals). The charge for examination and report has been fixed at 2s. 6d., which should be paid at the time of application, and the carriage of all parcels must be prepaid.

Zoologist.—Mr A. E. CAMERON, M.A., D.Sc., University of Edinburgh, 10 George Square, Edinburgh.

Objects and Usefulness of the Society

The Society devotes the whole of its resources to promoting the interests of the Agriculture of Scotland and allied industries.

The scope of the Society's work, beyond its great Annual Show, is indicated so far in the foregoing brief statement of the privileges of Members. Much is done, however, in addition to all this.

The Society makes grants of money and medals to a large number of Local Farming, Horticultural, and other Societies.

In conjunction with the Royal Agricultural Society of England, it holds annual examinations, and grants Diplomas in Agriculture. In conjunction with that Society and the British Dairy Farmers Association, it holds annual examinations, and grants Diplomas in Dairying.

The Society avoids questions of political controversy, but in other public matters of practical concern to Agriculture it seeks to guard and promote, by every means in its power, the welfare of all interested in the Agriculture of Scotland.

The influence and usefulness of the Society depend mainly upon its strength in membership. The Members, through the Directors whom they elect, have the

* Firms are not admitted as Members; but if one partner of a firm becomes a Member the firm is allowed to exhibit at Members' rates.

practical control of the affairs of the Society. The stronger the body of Members, the greater will be the usefulness of the Society. It will therefore be to both their own and the public advantage if all who are interested in Agriculture, and who are not already enrolled, should at once become Members of the Society.

Election of Members

Candidates for admission to the Society must be proposed by a Member, and are elected at the half-yearly General Meetings in January and June. It is not necessary that the proposer should attend the Meeting.

Conditions of Membership

Higher Subscription.—The ordinary annual subscription is £1, 3s. 6d., and the ordinary subscription for life-membership is £12, 12s.; or after ten annual payments have been made, £7, 7s.

Lower Subscription.—Proprietors farming the whole of their own lands, whose rental on the Valuation Roll does not exceed £500 per annum, and all Tenant-Farmers, Secretaries or Treasurers of Local Agricultural Associations, Factors resident on Estates, Land-Stewards, Foresters, Agricultural Implement Makers, Grain, Seed and Manure Merchants, Agricultural Auctioneers, Cattle Dealers and Veterinary Surgeons, none of them being also owners of land to an extent exceeding £500 per annum, and such other persons as, in respect of their official or other connection with Agriculture, the Board of Directors may consider eligible, are admitted on a subscription of 10s. annually, which may be redeemed by one payment of £7, 7s., and after eight annual payments of 10s. have been made, a Life Subscription may be purchased for £5, 5s., and after twelve such payments, for £3, 3s.*

* It must be stated, on behalf of Candidates claiming to be admitted at the Lower Rate, 10s., under which of the above designations they are entitled to be admitted at that rate.

According to the Charter, a Member who has not objected to his election, on the same being intimated to him by the Secretary, cannot retire until he has paid, in annual subscriptions or otherwise, an amount equivalent to a life composition.

Members are requested to fill in the names and addresses of Candidates they have to propose, stating whether the Candidates should be on the £1, 3s. 6d. or 10s. list, and return this Schedule to the Secretary, Mr JOHN STIRTON, No. 8 Eglinton Crescent, Edinburgh 12.

NAMES AND ADDRESSES OF CANDIDATES.	State whether on £1, 3s. 6d. or 10s. list.
<i>Name</i> <i>*Occupation</i> <i>Address</i> <i>County</i>	
<i>Name</i> <i>*Occupation</i> <i>Address</i> <i>County</i>	

* Must be filled in where Candidate claims to be eligible under the lower or 10s. rate of Subscription.

Signature of Proposer

Address

Date 1943

Subscription should not be sent until notice of election is received.

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